



United States Steel

[35660]

August 8, 2003

Ms. Alicia Blumberg
Tetra Tech, Inc.
10306 Eaton Place, Suite 340
Fairfax, VA 22030

**Re: United States Steel Corporation Gary Works
February 1978 Fish Impingement-Entrainment Study**

Dear Ms. Blumberg:

Please find enclosed a copy of the U.S. Steel Corporation Gary Works Fish Impingement-Entrainment Study Summary Data Report from February 1978. This report is being sent to you per your request on the behalf of the USEPA. If you should have any questions or concerns, please do not hesitate to contact me at (219) 888-3369.

Sincerely,

A handwritten signature in cursive script that reads "Lisa S. Carmichael".

Lisa S. Carmichael
Manager, Environmental Water Compliance
United States Steel Corporation Gary Works

Enclosure

WALTER E. JACKSON
ASSOCIATE DIRECTOR
ENVIRONMENTAL CONTROL—WEST



*States
Steel
Corporation*

600 GRANT STREET
PITTSBURGH, PENNSYLVANIA 15230

February 28, 1978

Mr. Oral H. Hert
Technical Secretary
State of Indiana
Stream Pollution Control Board
1330 West Michigan Street
Indianapolis, Indiana 46206

Gary Works NPDES
Fish Impingement-Entrainment Study

Dear Mr. Hert:

In accordance with our NPDES requirements, United States Steel Corporation hereby submits the enclosed report entitled, "U. S. Steel Corporation Gary Works Fish Impingement-Entrainment Study Summary Data Report" dated February 1978.

Very truly yours,

W. E. Jackson ore

DRC:mjh

Attachment

cc: B. G. Constantelos
Chief, Compliance and Engineering Section
U. S. Environmental Protection Agency

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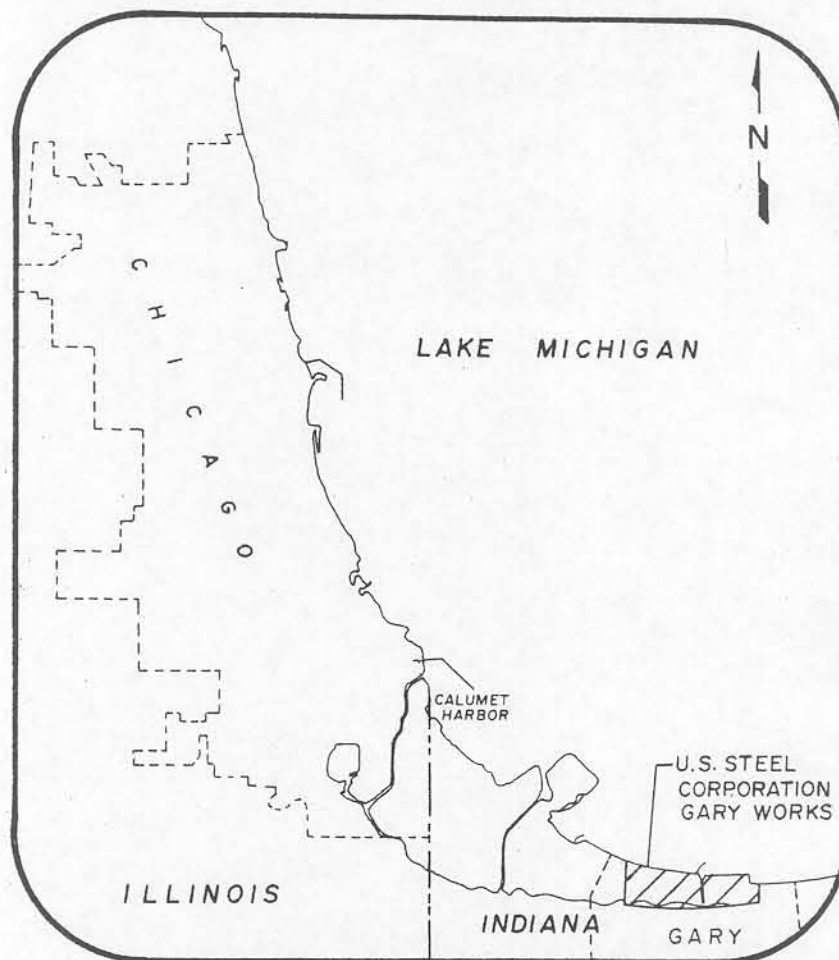
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GARY WORKS
UNITED STATES STEEL

35660 Intake
R5 Indiana

U.S. STEEL CORPORATION GARY WORKS
FISH IMPINGEMENT-ENTRAINMENT STUDY
SUMMARY DATA REPORT

FEBRUARY 1978



Prepared for
U.S. STEEL CORPORATION

by
ENERGY IMPACT ASSOCIATES, INC.
Pittsburgh, Pennsylvania

U. S. STEEL CORPORATION GARY WORKS
FISH IMPINGEMENT-ENTRAINMENT STUDY
SUMMARY DATA REPORT

Prepared For
U. S. STEEL CORPORATION
PITTSBURGH, PENNSYLVANIA

FEBRUARY 1978

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SECTION 1.0

SUMMARY

U. S. Steel Corporation Gary Works is a steel mill which produces finished and semi-finished steel products. Cooling water and process water for the mill is withdrawn from Lake Michigan by a number of water intakes. Lakeside pumphouse intake and No. 1 pumphouse intake are two such intakes. Lakeside pumphouse intake is a closed conduit offshore intake which supplies water to various plant processes in the hot strip mills. No. 1 pumphouse intake is a closed conduit shoreline intake which supplies various plant processes in the central mill area.

Water intakes can adversely affect fish populations in a water body by impinging fish directly on the traveling screens or by entraining ichthyoplankton (fish eggs and larvae). U. S. Steel Corporation contracted Westinghouse Environmental Systems Department, presently Energy Impact Associates, to conduct a fish impingement and ichthyoplankton entrainment program at Lakeside pumphouse intake and a fish impingement program at No. 1 pumphouse intake. Components of this program include the collection and analysis of fish impingement and ichthyoplankton entrainment samples and a summarization of the data obtained.

During thirty-six, 24-hour sampling periods at the Lakeside pumphouse intake, 1,388 fish representing ten species were collected from the traveling screens during the one year sampling program. Total weight of the fish collected was 11.03 kilograms (24.31 pounds). Rainbow smelt were the more frequently encountered fish on the traveling screens accounting for 67.43 percent of the total number of fish impinged followed by alewives (24.71 percent). In terms of fish weight, alewives (87.48 percent) and rainbow smelt (5.08 percent) were predominant.

At the No. 1 pumphouse intakes, 113,243 fish representing thirty species were collected from the traveling screens during the one year sampling program. Total weight of the fish collected was 3,437.54 kilograms

(7,578.56 pounds). Alewives were the predominant fish both in terms of abundance (90.06 percent) and weight (98.12 percent).

No threatened, rare or endangered fish species were collected at the No. 1 pumphouse intake or Lakeside pumphouse intake.

A total of 135 larval fish and 15,740 fish eggs were collected in pump samples from Lakeside pumphouse. Larval alewives and minnows were the more frequently encountered groups collected. Higher numbers of fish eggs and larvae appeared in the late spring and summer months.

SECTION 2.0 INTRODUCTION

2.1 PURPOSE

United States Steel Corporation (USSC) contracted Westinghouse Environmental Systems Department (WESD), presently Energy Impact Associates (EIA), to execute an intake monitoring program at their Gary Works. The purpose of this program was to determine the magnitude of fish impingement at their Lakeside pumphouse and No. 1 pumphouse intakes and the magnitude of ichthyoplankton (fish eggs and larvae) entrainment at Lakeside pumphouse. This report summarizes the results of this monitoring program.

2.2 SCOPE

The scope of the monitoring program required that fish impingement sampling be conducted at Lakeside pumphouse and No. 1 pumphouse intakes for a period of one year. Adult and juvenile fish caught and washed from the traveling screens during each 24-hour period were to be identified, enumerated, measured and weighed. Measurements were to be limited to 30 fish per species, but total counts and total weights for each species were to be reported. Frequency of fish impingement sampling was to be once each week from April through October and once each month from November through March (Table 2-1).

Ichthyoplankton entrainment sampling was to be conducted at the Lakeside pumphouse intake. Each 24-hour run was to be comprised of three, 8-hour runs. Two pumps were to be used in such a way as to continuously sample near the surface and near the bottom of the intake. Water from the pumps was to be passed through plankton nets having a mesh size of 350 microns or less. Fish eggs collected were to be enumerated and fish larvae identified to the lowest practical taxa and enumerated. Frequency of sampling was to be once each week from April through October (Table 2-1).

TABLE 2-1

SCHEDULE OF FISH IMPINGEMENT AND ENTRAINMENT SAMPLING AT USSC GARY WORKS
LAKESIDE AND NO. 1 PUMPHOUSE INTAKES

Date	Impingement		Entrainment Lakeside Pumphouse
	No. 1 Pumphouse	Lakeside Pumphouse	
January 27-28, 1977	X	X	X
February 24-25, 1977	X	X	X
March 17-18, 1977	X	X	X
April 6-7, 1977	X	X	X
April 14-15, 1977	X	X	X
April 21-22, 1977	X	X	X
April 28-29, 1977	X	X	X
May 5-6, 1977	X	X	X
May 12-13, 1977	X	X	X
May 19-20, 1977	X	X	X
May 26-27, 1977	X	X	X
May 31 - June 1, 1977	X	X	X
June 6-7, 1977	X	X	X
June 13-14, 1977	X	X	X
June 20-21, 1977	X	X	X
June 27-28, 1977	X	X	X
July 5-6, 1977	X	X	X
July 11-12, 1977	X	X	X
July 18-19, 1977	X	X	X
July 25-26, 1977	X	X	X
August 1-2, 1977	X	X	X
August 8-9, 1977	X	X	X
August 15-16, 1977	X	X	X
August 22-23, 1977	X	X	X
August 29-30, 1977	X	X	X
September 6-7, 1977	X	X	X
September 12-13, 1977	X	X	X
September 19-20, 1977	X	X	X
September 26-27, 1977	X	X	X
October 3-4, 1977	X	X	X
October 10-11, 1977	X	X	X
October 17-18, 1977	X	X	X
October 24-25, 1977	X	X	X
October 31 - November 1, 1977	X	X	X
November 10-11, 1977	X	X	X
December 8-9, 1977	X	X	X

Upon completion of the monitoring program a final report would be submitted containing a description of sampling methods, and data listings of fish impinged and ichthyoplankton entrained. This report contains those sampling methods and final data results.

SECTION 3.0

DESCRIPTION OF PUMPHOUSE INTAKES

USSC Gary Works is a steel mill producing finished and semi-finished steel products. The mill extends over approximately four square miles, bordered by Lake Michigan to the north and the Grand Calumet River and Gary, Indiana to the south (Figure 3-1).

Lakeside pumphouse intake is a closed conduit offshore intake (Figures 3-2 and 3-3). The crib is a multiple inlet type and is located 3000 feet from the lakeshore in about 40 feet of water. The intake openings are approximately 7 feet above the lake bottom and are capped with bars spaced 3.5 inches apart. No deicing provisions are required for the intake. A velocity of 0.2 feet per second has been reported at the mouth of the intake opening and 0.5 feet per second at the intake house traveling screens.⁽¹⁾ Debris entering the intake house is removed by a trash rack and series of four vertical traveling screens constructed with 1/4-inch mesh screen. Debris trapped on the traveling screens is washed into a trash trough by a jet spray backwash system and then into the lake.

No. 1 pumphouse intake is a closed conduit shoreline intake (Figures 3-2 and 3-4). The intake conduit openings are in the Gary Harbor slip and are capped with bars spaced six inches apart. Intake deicing is required. A velocity of 4.2 feet per second has been reported at the mouth of the intake conduit openings and 1.4 feet per second at the traveling screens.⁽¹⁾ Velocity determinations made at the mouths of the intake conduits on September 9, 1977 ranged from 0.71 to 1.95 feet per second (Figure 3-5). Debris entering the intake house is removed by a series of fourteen vertical traveling screens constructed with 1/4-inch mesh screen. Debris trapped on the traveling screens is washed into a trash trough by a jet spray backwash system and then emptied into two retaining baskets. The debris in these baskets is hauled away as required.

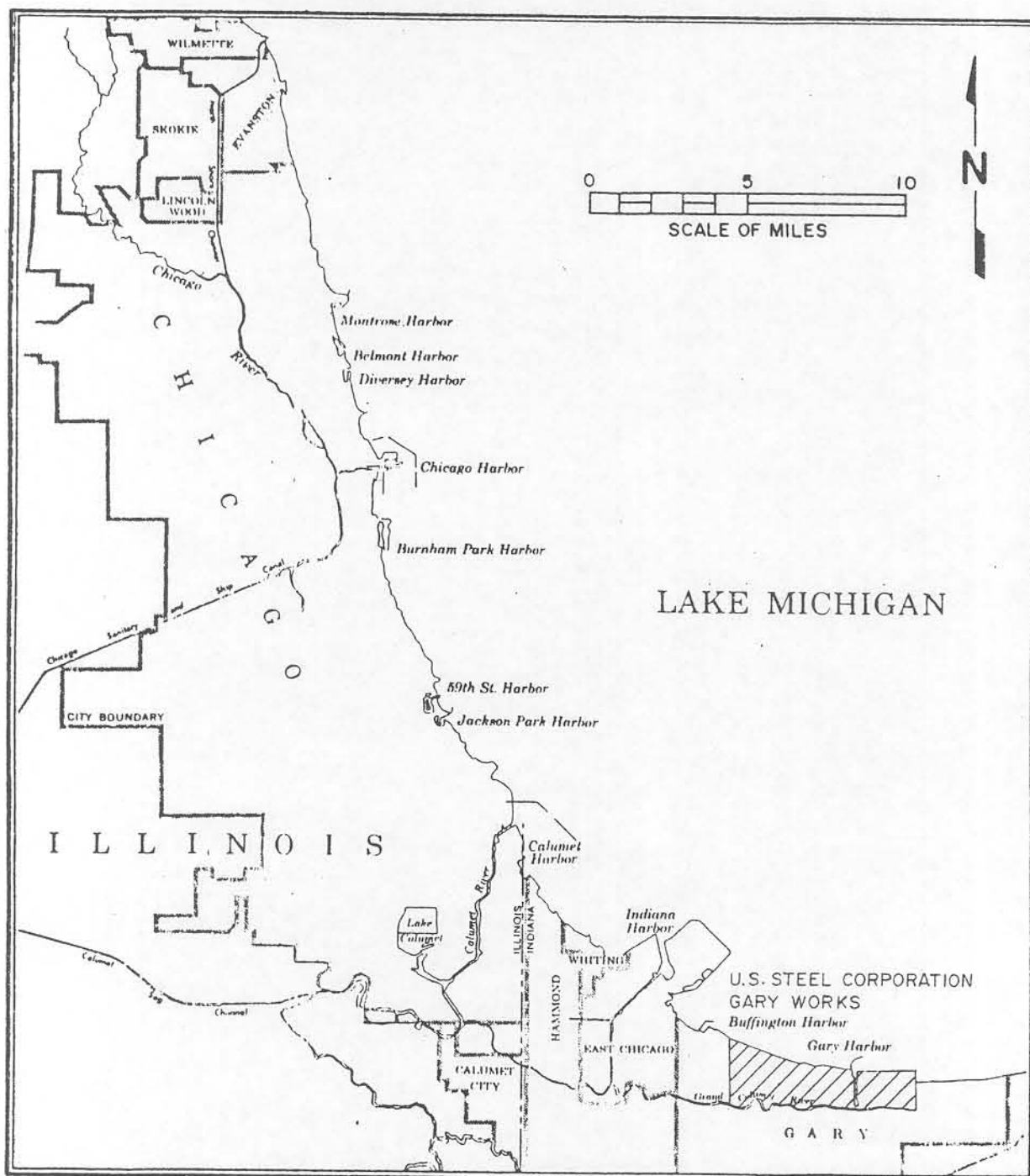


Figure 3-1. Location of United States Steel Corporation Gary Works

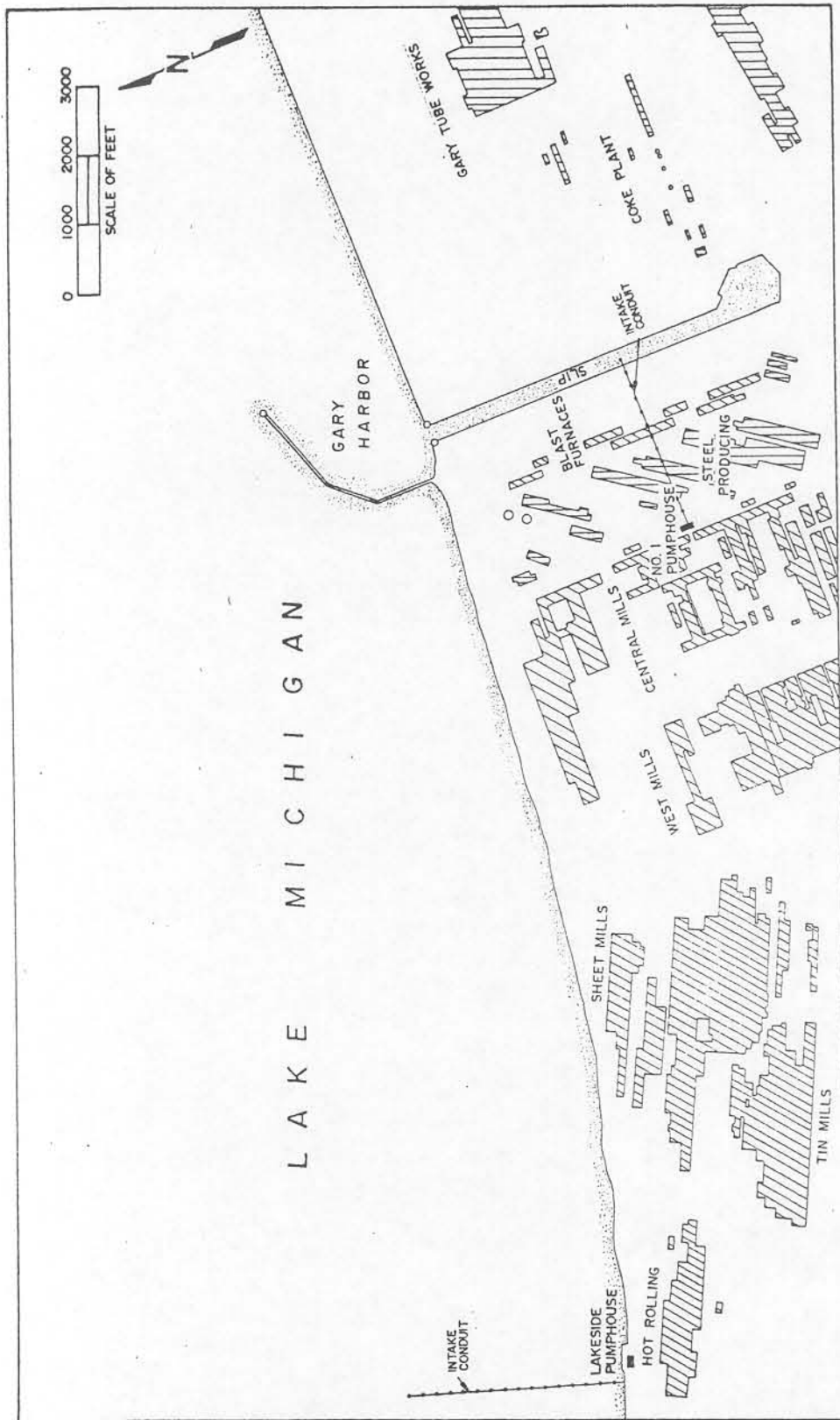


Figure 3-2. Location of Lakeside Pumphouse Intake and No. 1 Pumphouse Intake at U.S. Steel Corporation Gary Works

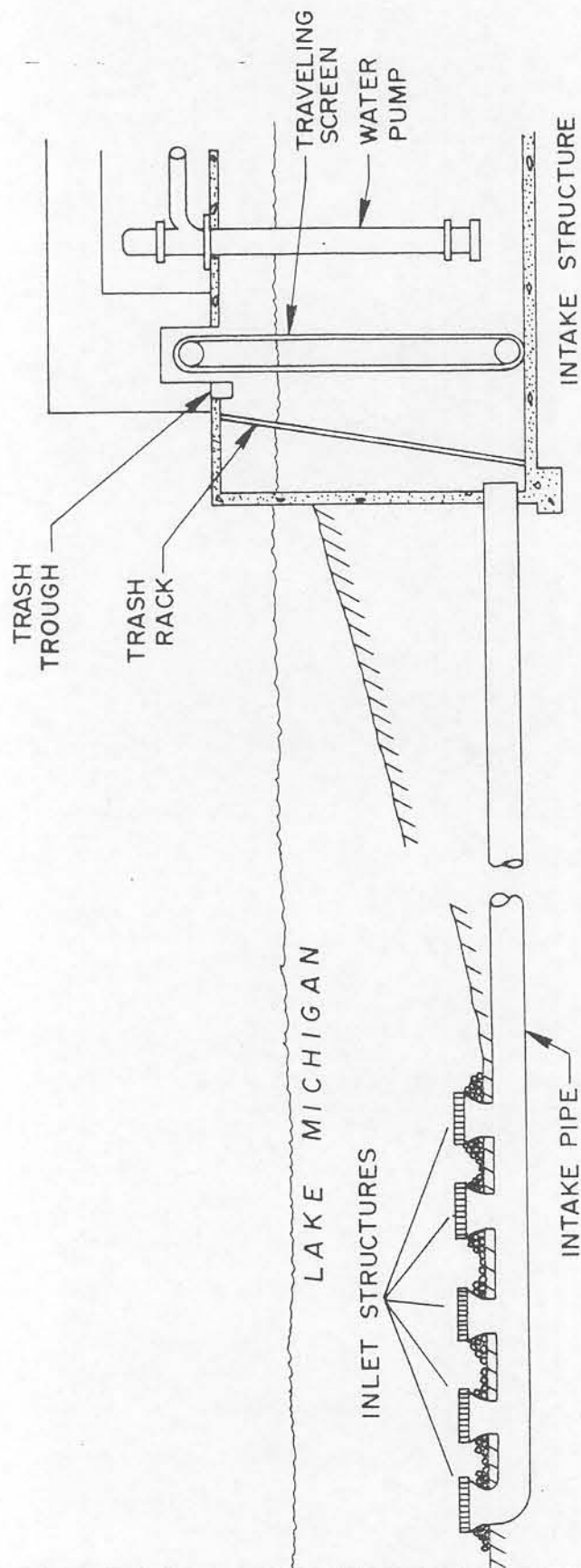


Figure 3-3. Generalized Drawing of Lakeside Pumphouse Intake at U.S. Steel Corporation
Gary Works

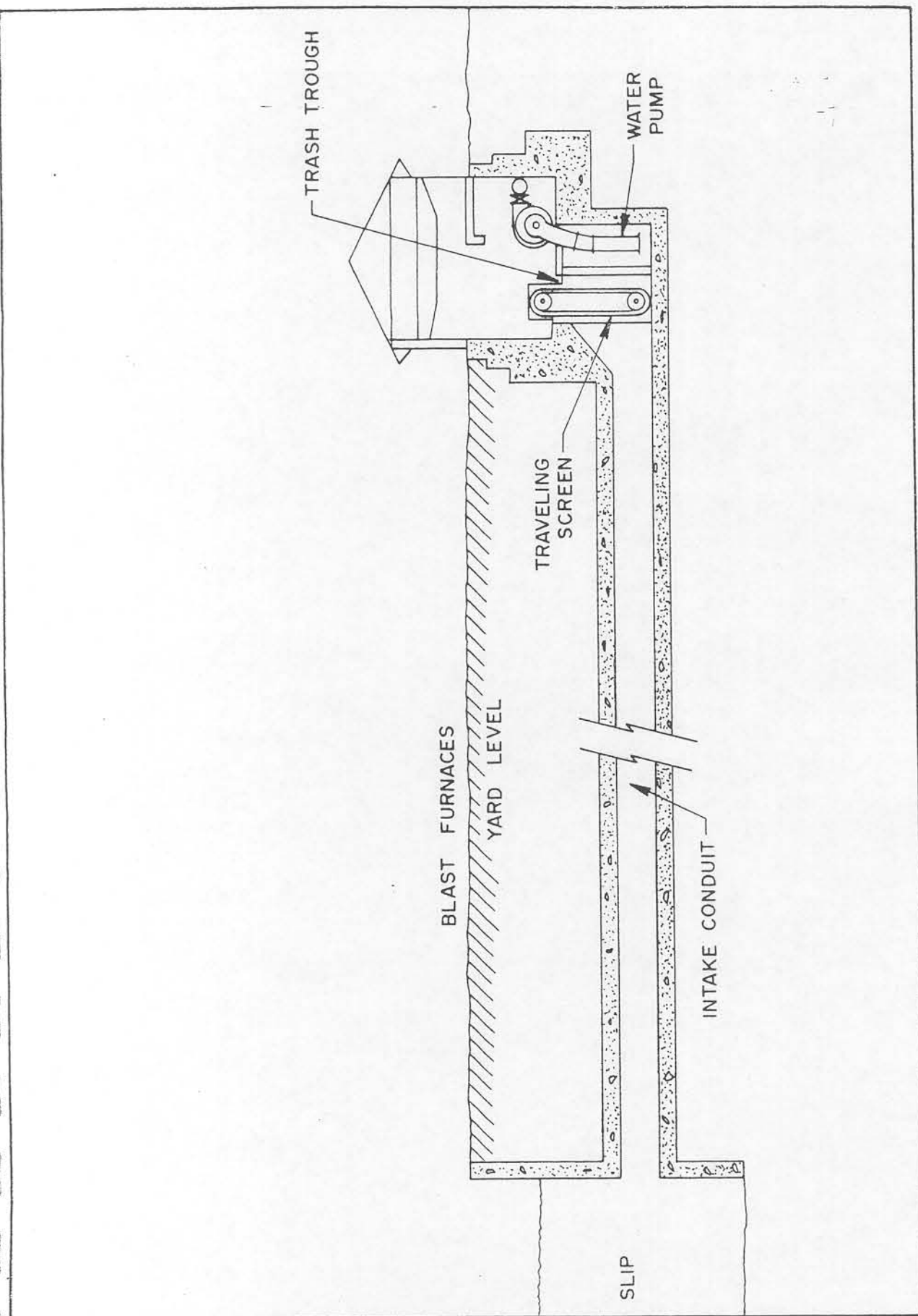


Figure 3-4. Generalized Drawing of No. 1 Pumphouse Intake At U.S. Steel Corporation Gary Works

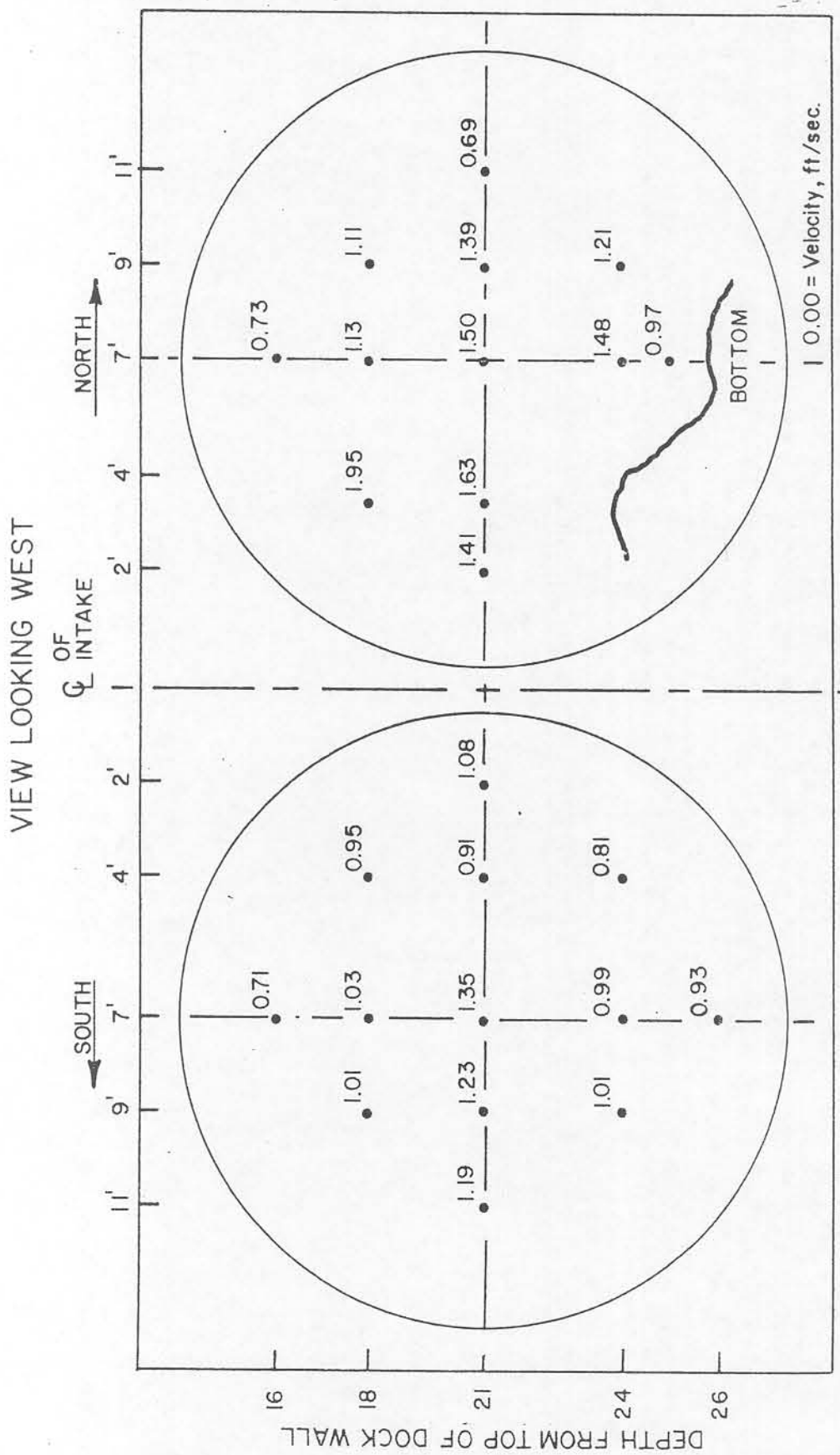


Figure 3-5. Velocity Pattern at Mouth of Intake Conduits of U.S. Steel Corporation Gary Works No. 1 Pumphouse Intake on September 9, 1977

SECTION 4.0

METHODS OF SAMPLE COLLECTION AND ANALYSIS

The scope of the monitoring program described in Section 2.2 was executed, and the sampling methods employed are described in the following sections.

4.1 FISH IMPINGEMENT

Debris and fish accumulated on the traveling screens of the Lakeside pumphouse intake and No. 1 pumphouse intake during the study were collected by backwashing the screens with a jet spray backwash system into a trash trough. At the Lakeside pumphouse intake, the trash trough was blocked with two 1/4-inch mesh screen retaining baskets on which the debris and fish accumulated. At the No. 1 pumphouse intake, two large baskets constructed of 1/4-inch mesh screen were suspended at the end of the trash trough and retained the debris and fish washed down this trash trough. Impingement collections were made at both pumphouse intakes using the following general procedures.

- o At the start of each collection period, all operational traveling screens were operated for 10 to 20 minutes during which time the jet spray washed debris on the screens into the trash trough. This run served to clean the screens of any previously accumulated debris.
- o After completing the cleaning run, clean collection baskets were put into position and the traveling screens were operated as required. During this time, debris accumulated in these baskets.
- o Periodic checks of these baskets were made during the 24-hour collection period to guard against overflow.
- o All screens were cleaned at least once every 8-hour shift and a portion or all of the accumulated debris was placed on ice.
- o At the end of the 24-hour period, all operational screens were backwashed for approximately 10 to 20 minutes and the accumulated debris was sorted to remove any fish present.

At the end of a 24-hour sampling period at the lakeside pumphouse intake, all of the fish collected were identified^(2,3) grouped into species classes, counted

and standard lengths (centimeters) and weights (grams) were measured. All specimens at this intake were retained and preserved in 10 percent formalin.

Processing of fish at the No. 1 pumphouse intake varied with the quantity of fish collected during the 24-hour sampling period. Under normal circumstances, at the end of approximately the first eight hours of sampling (and again at about sixteen hours), a small sample (20 to 30 pounds) of fish was removed from the collection basket and placed in a cooler for icing. The remainder of the fish were left in the collection basket. At the end of the 24-hour sampling period, the traveling screens were given a final wash and shut down. An overhead crane lifted the collection basket for draining.

If less than approximately 500 pounds of fish were collected at No. 1 pumphouse intake, they were dumped from the collection basket onto a 1/4-inch mesh net and were counted and weighed. A subsample of at least 30 fish of each species was preserved for later processing. If there were two or more obvious size classes, at least 30 specimens of each were preserved. If any one species included several hundred fish or more, three samples of 100 fish each were counted out and weighed for numerical estimates. The remainder were then bulk weighed.

If more than 500 pounds but less than 1500 pounds of fish were collected at No. 1 pumphouse intake, the sample was dumped into a large container (lugger box) lined with a 1/4-inch mesh net. The container with fish and water was weighed with a crane scale and the fish were processed as described in the previous paragraph. The greatest portion of the fish weight was usually attributable to alewives, which were not weighed separately as in the smaller samples. Instead, after removing and processing the other species, and then removing the alewives from the large container, the container was again weighed with the water included. The difference represents the weight of the total fish sample. Subtracting the weight of the other species leaves the total weight of the alewife sample. As above, three samples of 100 alewives were weighed for numerical estimates. Subsamples were preserved as described above.

Representative voucher specimens of each species were retained and suitably preserved at both intakes.

4.2 FISH EGG AND LARVAL ENTRAINMENT

Sampling for fish eggs and larvae at the Lakeside pumphouse intake was conducted on a weekly basis. Surface (approximately 1 meter from the water surface) and bottom (approximately 1 meter from the bottom) samples were collected using Kenco Model 139 submersible pumps. Water was pumped through 500 micron mesh plankton nets for three continuous 8-hour periods. All material retained in the plankton net was transferred to plastic containers, preserved with 10 percent formalin and retained for later analysis. All samples were examined for fish eggs and fish larvae. All larvae were identified^(4,5) to the lowest, practical taxon and enumerated. Fish eggs were enumerated.

No sampling for fish eggs and larvae was required at the No. 1 pumphouse intake.

SECTION 5.0 RESULTS

5.1 FISH IMPINGEMENT

5.1.1 LAKESIDE PUMPHOUSE INTAKE

A total of 1,388 fish representing ten species were collected from the traveling screens of USSC Gary Works Lakeside pumphouse intake during the thirty-six, 24-hour sampling periods over the one year monitoring program (Table 5-1). Total weight of fish collected during the program amounted to 11.03 kilograms or 24.31 pounds. Of the ten fish species identified among the collections, the more abundant fish species (i.e., those accounting for 5 percent or more of the total number fish collected) were rainbow smelt (67.43 percent) and alewives (24.71 percent). Those species which comprised major portions of the total weight of fish collected (i.e., those accounting for 5 percent or more of the total weight of fish collected) were alewives (87.48 percent) and rainbow smelt (5.08 percent).

Abundance, weight and species composition of fish collected from the traveling screens of Lakeside pumphouse intake varied among the sampling periods (Figure 5-1 and Appendix A). Total numbers of impinged fish ranged from a maximum of 614 fish on October 3-4, 1977 to a minimum of zero on both January 27-28 and April 21-22, 1977. Total weights of impinged fish ranged from a maximum of 4.90 kilograms on December 8-9, 1977 to a minimum of zero on both January 27-28 and April 21-22, 1977. At the Lakeside pumphouse intake, peaks in fish abundance and/or weight occurred in early summer and fall. The early summer peak can probably be attributed to the movement of adult alewives from deeper areas of the lake to shallower inshore areas to spawn. The fall peak was probably attributable to the offshore movement of young of the year rainbow smelt into deeper water.

TABLE 5-1

FISH IMPINGED ON TRAVELING SCREENS OF U. S. STEEL CORPORATION GARY WORKS LAKESIDE
PUMPHOUSE FROM JANUARY 27, 1977 THROUGH DECEMBER 9, 1977

Scientific Name	Common Name	Total Number of Fish	Percent of Total Number	Total Weight of Fish (grams)	Percent of Total Weight
<u>CLUPEIDAE (herring)</u>					
<u>Alosa pseudoharengus</u>	Alewife	343	24.71	9644.4	87.48
<u>COTTIDAE (sculpin)</u>					
<u>Cottus bairdi</u>	Mottled sculpin	21	1.51	125.2	1.14
<u>Cottus cognatus</u>	Slimy sculpin	3	0.22	24.4	0.22
<u>Cottus ricei</u>	Spoonhead sculpin	6	0.43	34.1	0.31
	Unidentified sculpin	1	0.07	5.5	0.05
<u>CYPRINIDAE (carp and minnows)</u>					
<u>Notropis hudsonius</u>	Spottail shiner	3	0.22	22.9	0.21
<u>GASTEROSTEIDAE (stickleback)</u>					
<u>Pungitius pungitius</u>	Ninespine sticklebacks	8	0.58	21.3	0.19
<u>OSMERIDAE (smelt)</u>					
<u>Osmerus mordax</u>	Rainbow smelt	936	67.43	660.2	5.08
<u>PERCIDAE (perch)</u>					
<u>Etheostoma nigrum</u>	Johnny darter	6	0.43	12.6	0.11
<u>Perca flavescens</u>	Yellow perch	9	0.65	158.1	1.43
<u>PERCOPSIDAE (trout-perch)</u>					
<u>Percopsis omiscomaycus</u>	Trout-perch	52	3.75	316.1	2.87
TOTALS		1388		11024.8	

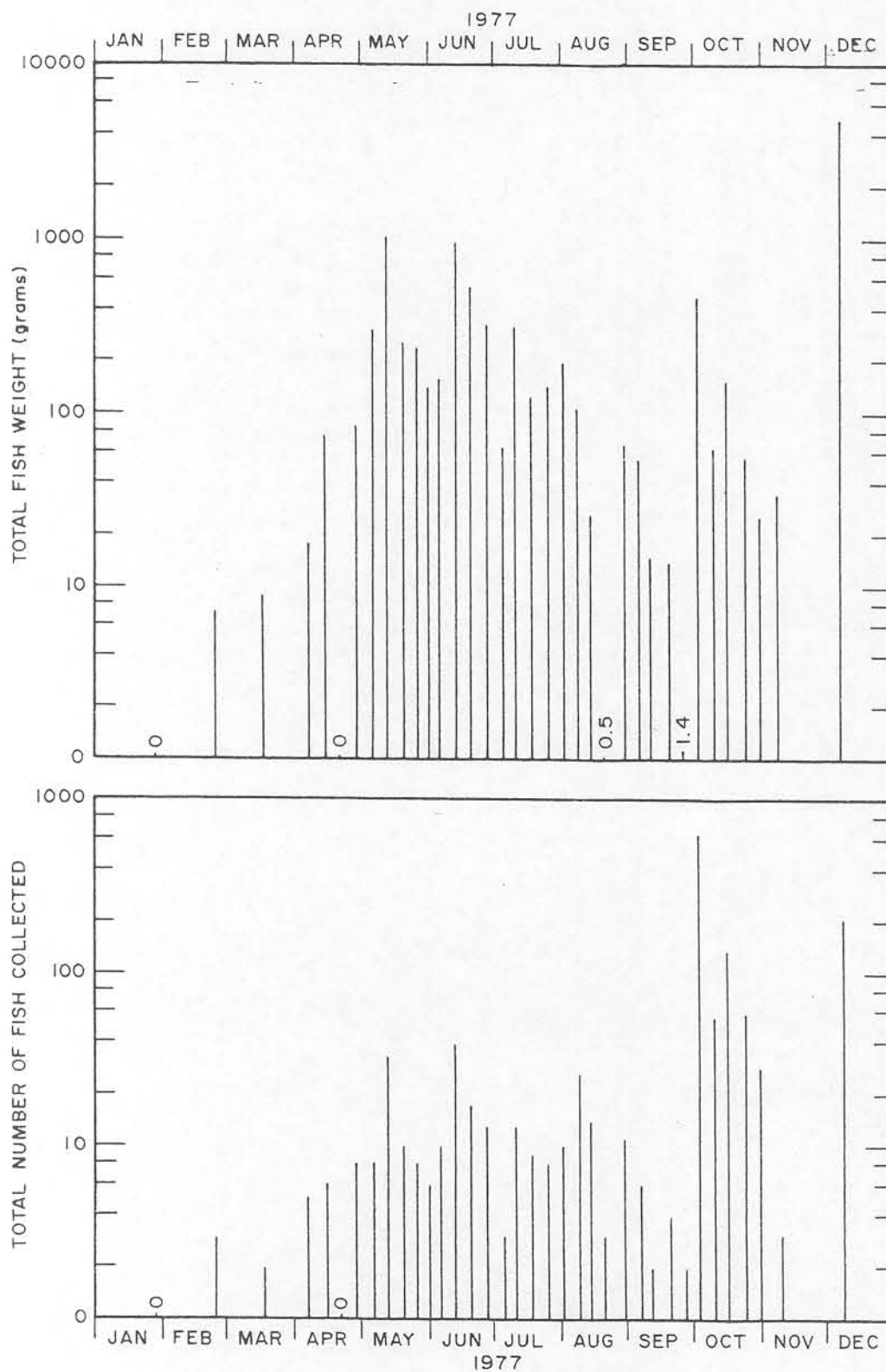


Figure 5-1. Variations in Total Number and Weight of Fish Collected From the Traveling Screens of Lakeside Pumphouse Intake at U. S. Steel Corporation's Gary Works during Each 24-hour Sampling Period

5.1.2 NO. 1 PUMPHOUSE INTAKE

A total of 113,243 fish representing thirty species were collected from the traveling screens of USSC Gary Works No. 1 pumphouse intake during the thirty-six, 24-hour sampling periods during the one year monitoring program (Table 5-2). Total weight of fish collected during the program amounted to 3,437.57 kilograms or 7,578.56 pounds. Of the thirty species identified among the collections, the most abundant fish species (i.e., those accounting for 5 percent or more of the total number of fish collected) was the alewife (90.06 percent). The alewife also comprised the major portion of the total weight of fish collected (98.12 percent).

The abundance, weight and species composition of fish collected from the traveling screens of No. 1 pumphouse intake varied among the sampling periods (Figure 5-2 and Appendix B). Total numbers of impinged fish ranged from a maximum of 20,356 fish on April 28-29, 1977 to a minimum of 25 fish on February 24-25, 1977. Total weights of impinged fish ranged from a maximum of 755.00 kilograms on April 28-29, 1977 to a minimum of 0.17 kilograms on November 1-2, 1977. At the No. 1 pumphouse intake, peaks in fish abundance and/or weight occurred in the spring and fall. The spring peak can probably be attributed to the movement of adult alewives from deeper areas of the lake to shallower inshore areas to spawn. The fall peak was probably attributable to the offshore movement of young of the year alewives.

5.1.3 DISCUSSION OF SELECT FISH SPECIES

Species discussed in the following sections were selected because of their abundance or proportion of the total fish weight in the collections from the traveling screens of USSC Gary Works Lakeside and No. 1 pumphouse intakes or because of their importance to the commercial fishery of Lake Michigan.

TABLE 5-2

SUMMARY OF FISH IMPINGED ON TRAVELING SCREENS OF U.S. STEEL CORPORATION
GARY WORKS NO. 1 PUMPHOUSE FROM JANUARY 27, 1977 THROUGH DECEMBER 9, 1977

Scientific Name	Common Name	Total Number of Fish	Percent of Total Number	Total Weight of Fish (grams)	Percent of Total Weight
AMIIDAE (bowfin)					
<u>Amia calva</u>	Bowfin	3	<0.01	2,263.2	0.07
CATOSTOMIDAE (sucker)					
<u>Catostomus commersoni</u>	White sucker	1	<0.01	526.6	0.01
CENTRARCHIDAE (sunfish)					
<u>Ambloplites rupestris</u>	Rock bass	1	<0.01	248.7	0.01
<u>Lepomis gulosus</u>	Warmouth	1	<0.01	35.2	<0.01
<u>Lepomis macrochirus</u>	Bluegill	8	0.01	90.3	<0.01
<u>Micropterus dolomieu</u>	Smallmouth bass	1	<0.01	2.7	<0.01
<u>Micropterus salmoides</u>	Largemouth bass	1	<0.01	7.9	<0.01
CLUPEIDAE (herring)					
<u>Alosa pseudoharengus</u>	Alewife	101,990	90.06	3,372,801.7	98.12
<u>Dorosoma cepedianum</u>	Gizzard shad	1,092	0.96	19,121.4	0.56
COTTIDAE (sculpin)					
<u>Cottus bairdi</u>	Mottled sculpin	134	0.12	1,088.5	0.03
<u>Cottus cognatus</u>	Slimy sculpin	45	0.04	312.1	0.01
<u>Cottus ricei</u>	Spoonhead sculpin	4	<0.01	10.3	<0.01
CYPRINIDAE (carp and minnows)					
<u>Carassius auratus</u>	Goldfish	1	<0.01	148.2	<0.01
<u>Cyprinus carpio</u>	Carp	3	<0.01	8,001.8	0.23
<u>Notemigonus crysoleucas</u>	Golden shiner	2	<0.01	9.4	<0.01
<u>Notropis antherinoides</u>	Emerald shiner	3	<0.01	19.3	<0.01
<u>Notropis hudsonius</u>	Spottail shiner	1,227	1.08	10,526.3	0.31
<u>Pimephales notatus</u>	Bluntnose minnow	1	<0.01	2.0	<0.01
<u>Rhinichthys cataractae</u>	Longnose dace	6	<0.01	16.1	<0.01
GASTEROSTEIDAE (stickleback)					
<u>Pungitius pungitius</u>	Ninespine stickleback	461	0.41	1,298.6	0.04
ICTALURIDAE (freshwater catfish)					
<u>Ictalurus melas</u>	Black bullhead	5	<0.01	635.0	0.02
<u>Ictalurus punctatus</u>	Channel catfish	1	<0.01	34.7	<0.01
OSMERIDAE (smelt)					
<u>Osmerus mordax</u>	Rainbow smelt	5,588	4.93	6,627.4	0.19
PERCIDAE (perch)					
<u>Etheostoma nigrum</u>	Johnny darter	510	0.45	730.5	0.02
<u>Perca flavescens</u>	Yellow perch	859	0.76	12,002.3	0.35
PERCOPSIDAE (trout-perch)					
<u>Percopsis omiscomaycus</u>	Trout-perch	1,266	1.12	9,134.2	0.27
SALMONIDAE (trout)					
<u>Oncorhynchus kistutch</u>	Coho salmon	5	<0.01	126.1	<0.01
<u>Oncorhynchus tshawtscha</u>	Chinook salmon	1	<0.01	103.6	<0.01
<u>Salmo gairdneri</u>	Rainbow trout	11	0.01	532.5	0.01
<u>Salvelinus namaychus</u>	Lake trout	3	<0.01	1,255.7	0.04
Unidentified salmonid		9	0.01	30.4	<0.01
	TOTALS	113,243		3,437,574.8	

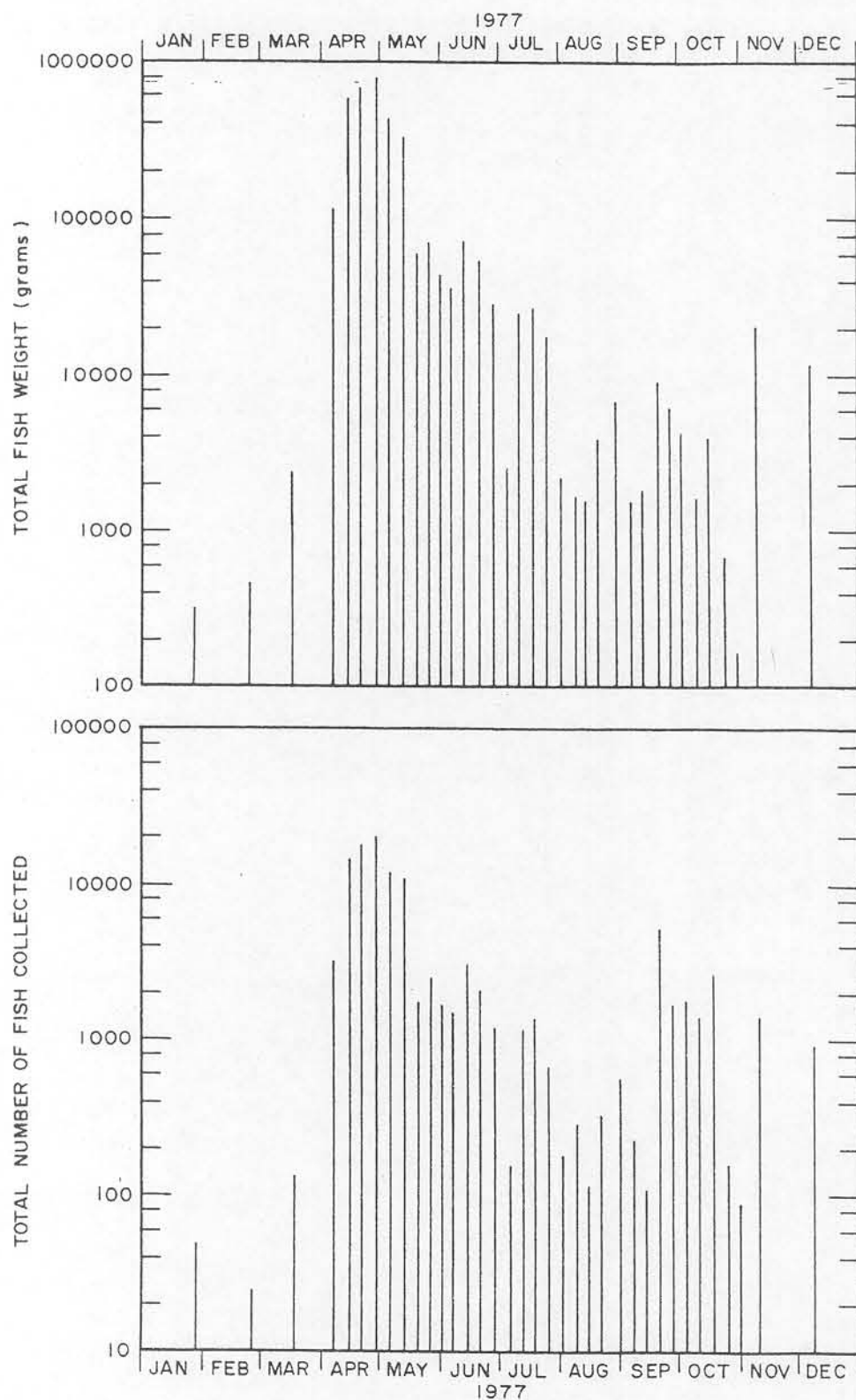


Figure 5-2. Variations in Total Number and Weight of Fish Collected From The Traveling Screens of No. 1 Pumphouse Intake at U. S. Steel Corporation's Gary Works During Each 24-hour Sampling Period

5.1.3.1 ALEWIFE

Alewives spread rapidly throughout Lake Michigan after their first appearance in 1949⁽⁶⁾ and at present inhabit and dominate all areas of the lake at different times of the year. However, they appear to be most abundant in the southern portion of the lake.^(1,7)

Alewives are generally found in deeper water in winter^(1,8) but migrate inshore in spring and early summer to spawn. Eggs are deposited when the temperature is between 55° and 60°F, preferably in quiet water. The eggs adhere to stones or sticks and hatch in about six days. After spawning, the adults disperse out into the lake and the newly hatched young inhabit the warm nearshore areas. Both adult and young fish migrate to deeper water in late fall.

These migratory movements of the alewife were evident in fish collections from the traveling screens at USSC Gary Works Lakeside pumphouse and No. 1 pumphouse intakes. These movements were particularly apparent in the pattern of alewife occurrence at the No. 1 pumphouse intake. In spring and early summer, the number and weight of alewives collected indicated the presence of numerous, adult fish (age 1 or age 2) in the impingement collections (Figure 5-3). In August, however, this age group of alewives was decreasing in abundance and a new smaller age group (age 0) began to appear. During the fall months, these smaller alewives continued to grow and gradually began to disperse out into the lake. These migratory movements were not as apparent at the Lakeside pumphouse intake (Figure 5-4).

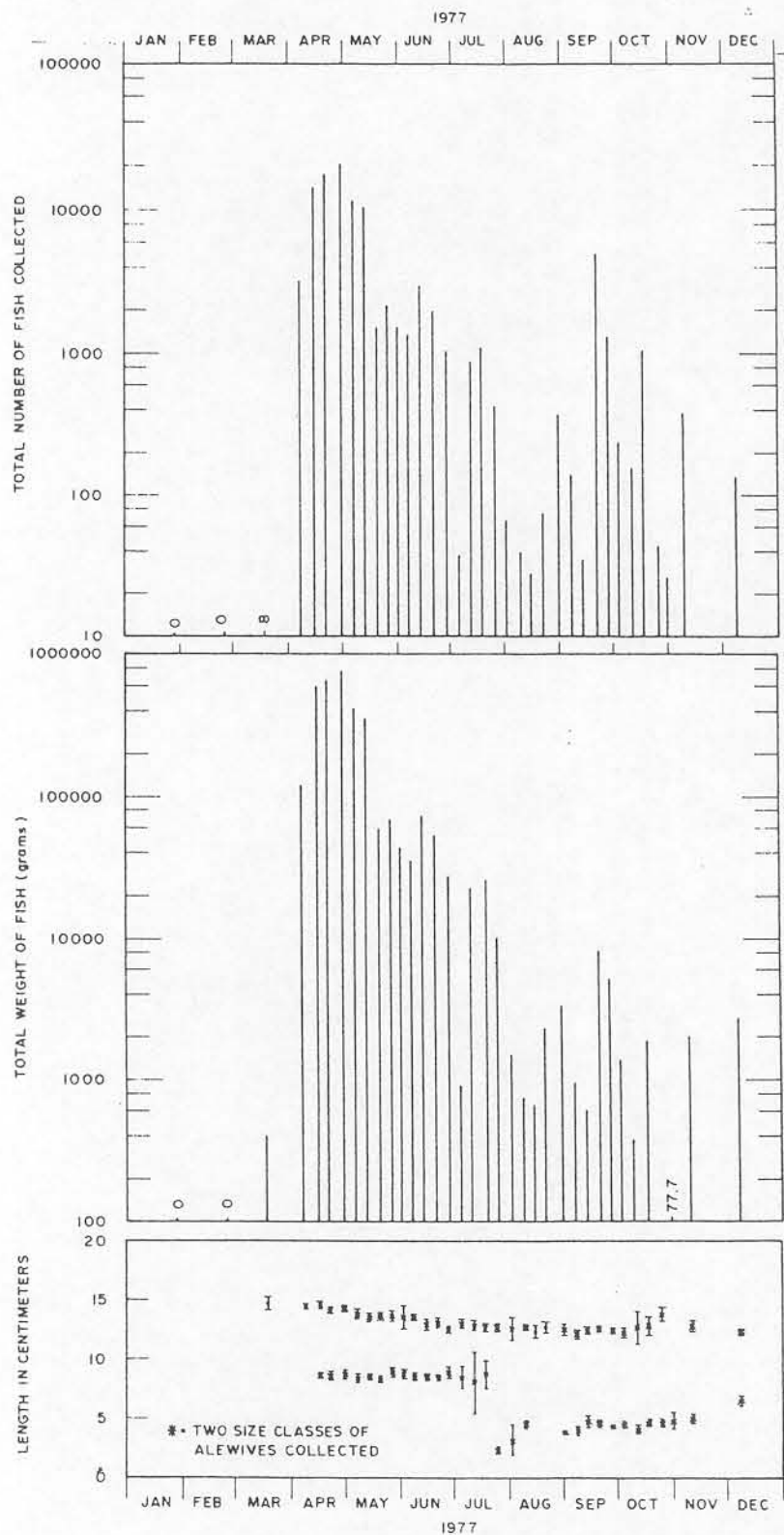


Figure 5-3. Variations in the Number, Weight, Mean Length (•) and 90 Percent Confidence Limits (I) of Alewives Collected From the Traveling Screens of No. 1 Pumphouse Intake at USSC Gary Works During Each 24-hour Sampling Period

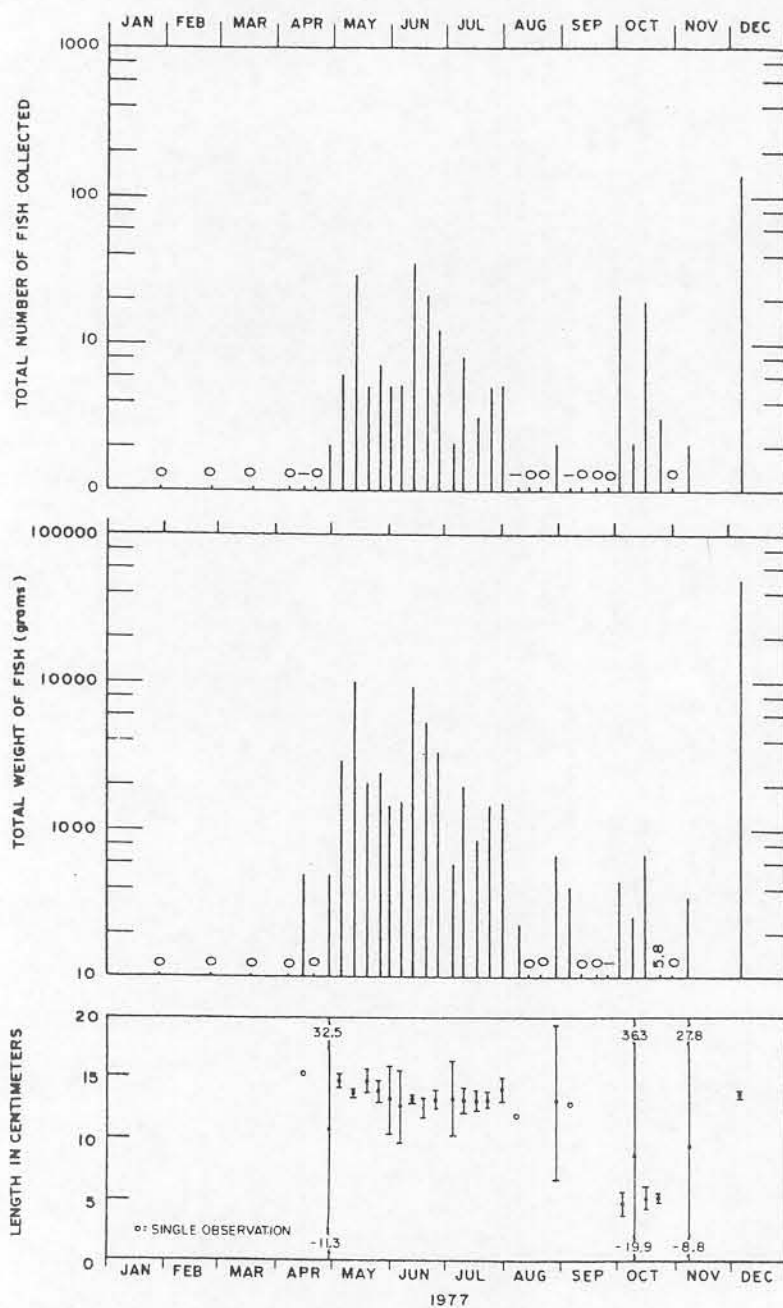


Figure 5-4. Variations in the Number, Weight, Mean Length (•) and 90 Percent Confidence Limits (I) of Alewives Collected From the Traveling Screens of Lakeside Pumphouse Intake at USSC Gary Works During Each 24-hour Sampling Period

Alewives are considered to be the single most important fish species in Lake Michigan from a biological point of view.⁽⁷⁾ They directly and indirectly affect the survival, growth and abundance of other larger species such as lake trout. Salmonid stocking programs have helped stabilize the abundance of alewives in recent years and relieved population pressures on other species such as yellow perch, rainbow smelt and bloaters.⁽⁷⁾

Although it is anticipated that wide, natural fluctuations in alewife year class strength and abundance will occur in the future, a general decline in abundance has been forecasted, assuming that predatory salmonid populations continue to increase.⁽⁷⁾

Alewives currently provide the largest portion of the commercial catch among fish species in Lake Michigan (Table 5-3). They have been marketed in the eastern United States for fertilizer or for fish meal, but are generally considered to be of minimal economic value.⁽⁹⁾ In 1976, the commercial value of the alewife was \$0.014 per pound.⁽¹⁰⁾ Although they accounted for 81.1 percent (39,212,097 pounds) of the total commercial catch in 1976 they only accounted for 8.8 percent (\$470,545.16) of the total dollar value of the commercial catch in all of Lake Michigan.⁽¹¹⁾

At Lakeside pumphouse and No. 1 pumphouse intakes, 21.26 pounds and 7435.75 pounds of alewives were collected from the respective intakes. Extrapolating these values to annual values would mean approximately 403 pounds of alewives would be impinged at the Lakeside pumphouse intake annually and 53,211 pounds at No. 1 pumphouse intake. These quantities combined are equal to 0.14 percent of the lakewide commercial catch in 1976 which would commercially be worth \$658.76.

5.1.3.2 RAINBOW SMELT

Rainbow smelt occur throughout Lake Michigan but currently appear to be most common in the northern and western portions of the lake.^(1,7)

TABLE 5-3

COMMERCIAL FISH PRODUCTION FOR LAKE MICHIGAN BASED ON 1976 U.S. FISH
AND WILDLIFE SERVICE DATA^(10,11)

Species	Wisconsin		Indiana		Illinois		Michigan		Total	
	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
Alewives	34,589,768	415,077.22	1,547	18.56			4,620,782	55,449.38	39,212,097	470,545.16
Bowfin	25		29						25	
Brown trout									29	
Buffalo fish	6								6	
Bullheads	119,875	8,271.38							119,875	8,271.38
Burbot	130,254	2,605.08	10	.20			303,28	606.56	160,592	3,211.84
Carp	748,407	22,452.21	112	3.36			181	5.43	748,700	22,461.00
Catfish	353	128.14	357	129.59					710	257.73
Chubs (No. 1 human)	214,353	220,354.88	1,642	1,687.98	28,530	29,328.84	176,649	181,595.17	421,174	432,966.87
Chubs (No. 2 human)	506	520.17							506	520.17
Coho salmon			103						103	
Gizzard shad	11		67						78	
Lake herring (No. 1)	1,599	933.82					9	5.26	1,609	939.07
Lake trout (lean)	3,690	2,154.96	5,741	3,352.74			138	80.59	9,569	5,588.30
Northern pike	15,659	2,615.05							15,659	2,615.05
Sheepshead	1,292						4		1,296	
Smelt (human food)	204,333	9,399.32			11,696	538.02	1,964,416	90,363.14	2,186,058	100,558.67
Suckers	281,097	3,654.26	5,613	258.20			140,744	1,829.67	425,856	5,536.13
Walleye	5,913	4,925.53	4,015	52.20			7	5.83	5,920	4,831.36
White bass	4,165	1,636.85							4,165	1,636.85
Whitefish	1,612,491	1,346,429.99	175	146.13			2,457,459	2,051,978.27	4,070,125	3,396,554.38
Menominee	19,655	8,392.69					112,306	47,954.66	131,961	56,347.35
Yellow perch	448,688	439,265.55	180,786	176,989.49	224,089	219,383.13	82	80.28	853,645	835,718.46
TOTALS	38,402,140	4,488,817.10	200,197	182,638.45	264,315	249,249.99	9,503,105	2,429,954.24	48,369,757	5,350,659.77

In the Great Lakes, smelt usually inhabit water from 50 to 200 feet in depth.⁽⁹⁾ Younger smelt stay in shallow water until mid-summer when they move into deeper water. As spawning season approaches, mature smelt move inshore and assemble in large schools. Spawning runs start when the ice melts and when temperatures reach 48°F. Spawning lasts for about three weeks and generally peaks in May.⁽¹²⁾

Although not as abundant as alewives, rainbow smelt were commonly encountered in collections from the Lakeside and No. 1 pumphouse intakes. At No. 1 pumphouse intake, rainbow smelt were more common in the fall months (Figure 5-5). No readily apparent pattern in the size class of fish present during this time was discernible. At Lakeside pumphouse intake rainbow smelt were also more common during the fall months (Figure 5-6).

Rainbow smelt are important in the diet of Lake Michigan salmonids, are important to man as a food fish and are of some recreational value.^(1,7) Smelt currently constitute only a small portion of the commercial catch among fish species in Lake Michigan (Table 5-3). In 1976, they accounted for 4.5 percent (2,186,058 pounds) of the total commercial catch and 1.9 percent (\$100,558.67) of the total dollar value of the commercial catch.^(10,11)

At Lakeside pumphouse and No. 1 pumphouse intakes 1.23 pounds and 14.6 pounds of smelt were collected respectively. Extrapolating these values to annual values would mean approximately 14 pounds of smelt would be impinged at the Lakeside pumphouse and 142 pounds at No. 1 pumphouse. These quantities combined are equal to 0.007 percent of the lakewide commercial catch in 1976 which would be worth \$7.04.

5.1.4 RARE AND ENDANGERED FISH SPECIES

None of the fish removed from the traveling screens at Lakeside pumphouse intake or No. 1 pumphouse intake at USSC Gary Works appear on either the State of Indiana⁽¹³⁾ or Federal⁽¹⁴⁾ lists of threatened, rare or endangered species.

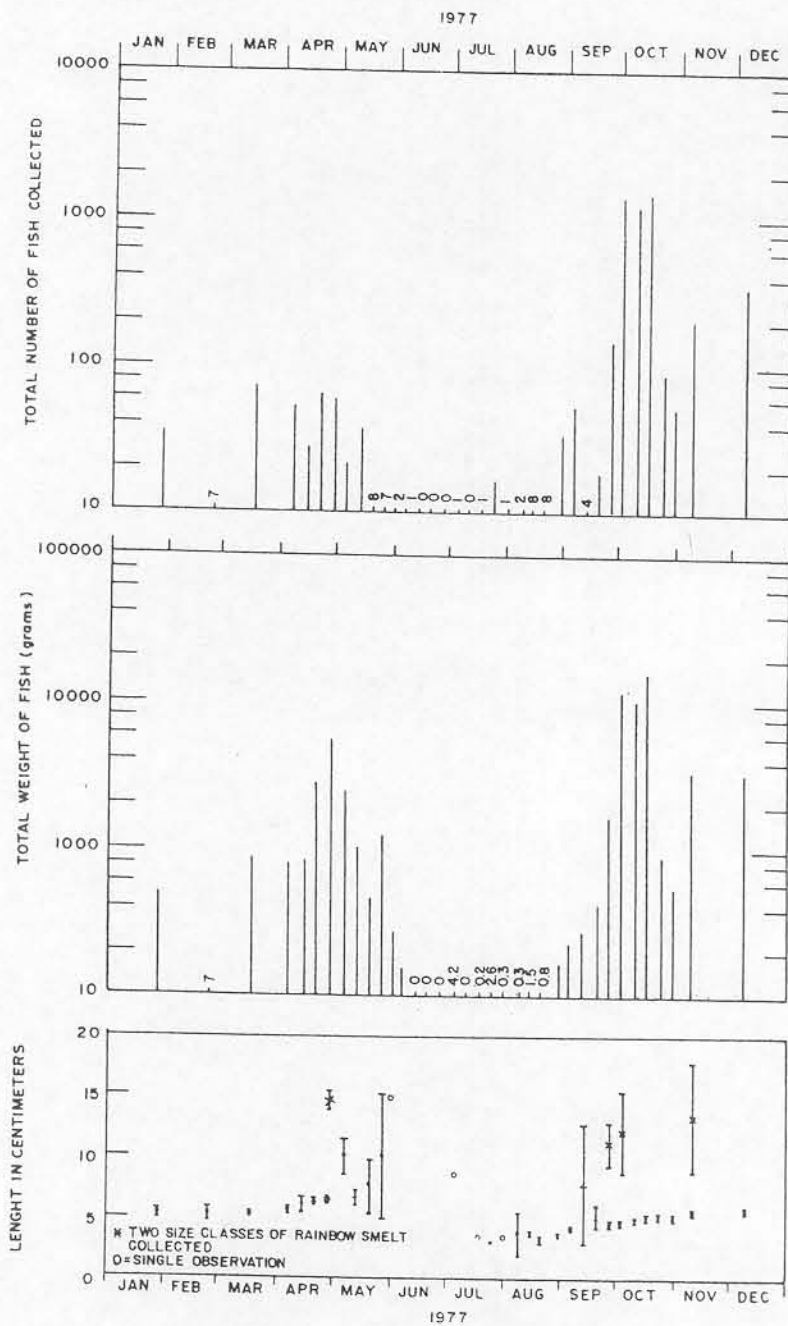


Figure 5-5. Variations in the Number, Weight, Mean Length (•) and 90 Percent Confidence Limits (I) of Rainbow Smelt Collected From the Traveling Screens of No. 1 Pumphouse Intake at USSC Gary Works During Each 24-hour Sampling Period

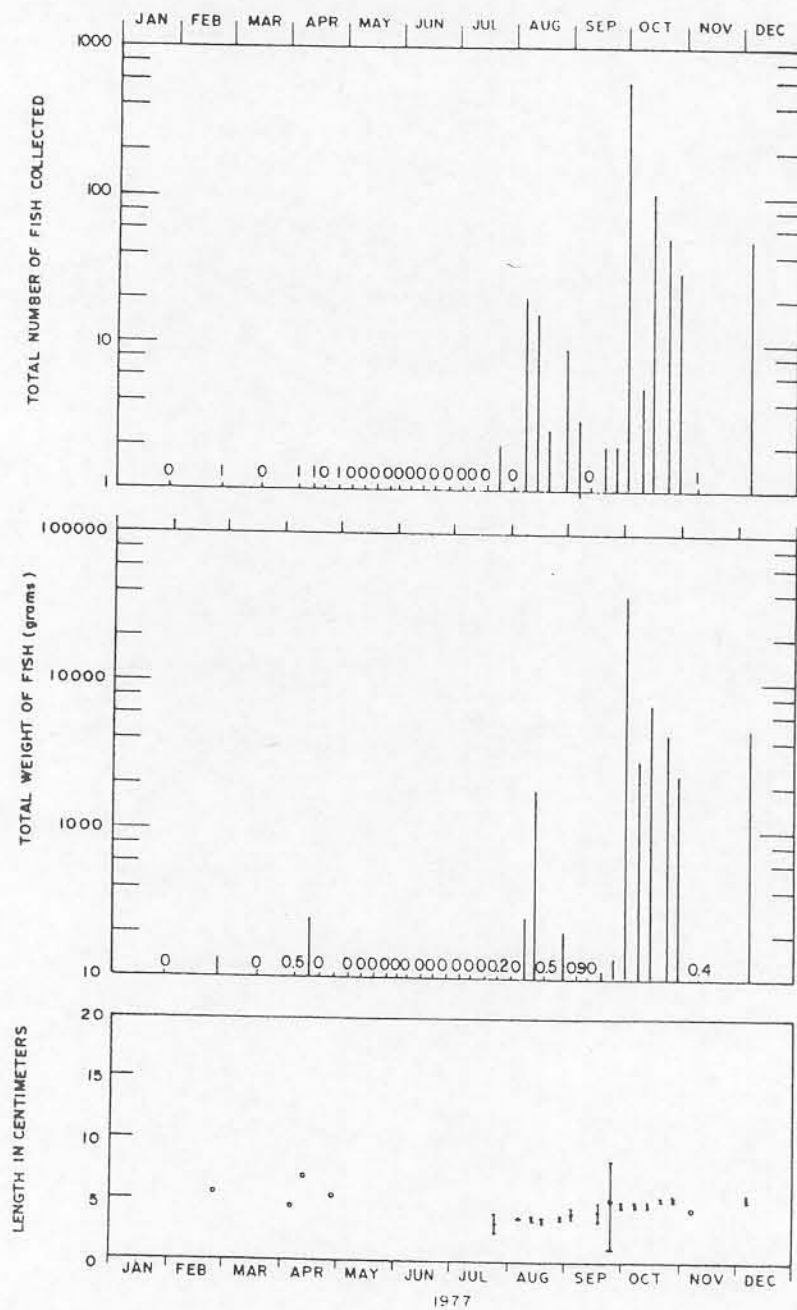


Figure 5-6. Variations in the Number, Weight, Mean Length (•) and 90 Percent Confidence Limits (I) of Rainbow Smelt Collected From the Traveling Screens of Lakeside Pumphouse Intake at USSC Gary Works During Each 24-hour Sampling Period

5.2 FISH EGG AND LARVAL ENTRAINMENT

A total of 15,740 fish eggs and 135 fish larvae were collected from the intake house of USSC Gary Works Lakeside pumphouse intake during the thirty-one, 24-hour sampling periods over the one year monitoring program (Table 5-4). The more abundant larvae collected were alewives (34.1 percent) and minnows (20.7 percent). Fish eggs were enumerated but not identified.

Abundance of fish eggs and larvae collected at the Lakeside pumphouse intake varied among the sampling periods (Table 5-5). Number of fish larvae collected ranged from a maximum of 44 per 1000 cubic meters of water on June 6-7, 1977 to a minimum of zero on a number of occasions. Numbers of fish eggs ranged from a maximum of 3,164 per 1000 cubic meters on July 25-26, 1977 to a minimum of zero on a number of occasions. At Lakeside pumphouse occurrence of both fish eggs and larvae was restricted to late spring and summer months.

Fish eggs and larvae at the Lakeside pumphouse intake were sampled at different levels in the water column and at three separate time intervals. Statistical analyses (Wilcoxon's signed ranks test for paired observations) of the numbers of fish eggs and larvae in samples collected just below the water surface and near the bottom indicated that fish eggs and larvae were not more abundant at either of the two levels sampled (Appendix G, Table 5-5). Fish eggs and larvae collected at different times of the day (Table 5-6) were also analyzed (Friedman's two-way analysis of variance by ranks). This analysis indicated that the numbers of eggs and larvae collected during the three time periods did not occur equally among the time periods (Appendix G).

TABLE 5-4

FISH EGGS AND LARVAE COLLECTED IN PUMP SAMPLES AT U.S. STEEL CORPORATION
GARY WORKS LAKESIDE PUMPHOUSE FROM APRIL 6 THROUGH NOVEMBER 1, 1977

<u>Common Name</u>	<u>Developmental Stage</u>	<u>Number of Larvae</u>	<u>Percent Relative Abundance</u>
Alewife	early prolarvae	1	34.1
	prolarvae	17	
	postlarvae	28	
Minnow	prolarvae	28	20.7
Rainbow smelt	prolarvae	1	8.8
	late prolarvae	1	
	postlarvae	3	
	late postlarvae	3	
	juvenile	4	
Smallmouth bass	prolarvae	1	0.7
Trout-perch	prolarvae	8	5.9
Yellow perch	prolarvae	16	11.9
Unidentifiable		<u>24</u>	<u>17.8</u>
Total larvae		135	99.9
Total eggs		15740	

TABLE 5-5

CALCULATED FISH EGG AND LARVAL DENSITIES IN SURFACE AND BOTTOM PUMP SAMPLES AT
U.S. STEEL CORPORATION GARY WORKS LAKESIDE PUMPHOUSE FROM APRIL 6
THROUGH NOVEMBER 1, 1977

Collection Date	Larvae per 1000 Cubic Meters		Eggs per 1000 Cubic Meters		Total Larvae per 1000 Cubic Meters	Total Eggs per 1000 Cubic Meters
	Surface	Bottom	Surface	Bottom		
April 6-7, 1977	0	0	0	0	0	0
April 14-15, 1977	0	0	0	0	0	0
April 21-22, 1977	0	0	0	0	0	0
April 28-29, 1977	0	2	0	0	1	0
May 5-6, 1977	0	0	0	0	0	0
May 12-13, 1977	0	0	4	2	0	3
May 19-20, 1977	0	0	0	0	0	0
May 26-27, 1977	0	0	225	0	0	113
May 31-June 1, 1977	2	5	1134	1625	4	1380
June 6-7, 1977	36	52	704	699	44	702
June 13-14, 1977	4	25	744	885	15	815
June 20-21, 1977	2	11	1033	953	7	993
June 27-28, 1977	4	5	979	1903	5	1441
July 5-6, 1977	4	5	2591	2325	5	2458
July 10-11, 1977	4	2	4520	3287	3	3904
July 18-19, 1977	0	0	2267	2106	0	2187
July 25-26, 1977	39	16	2387	3940	28	3164
August 1-2, 1977	11	7	585	358	9	471
August 8-9, 1977	11	12	135	57	12	96
August 15-16, 1977	8	0	14	2	4	8
August 22-23, 1977	25	0	171	51	13	111
August 29-30, 1977	2	0	0	0	1	0
September 6-7, 1977	10	0	0	0	5	0
September 12-13, 1977	0	0	0	0	0	0
September 19-20, 1977	4	0	4	0	2	2
September 26-27, 1977	0	0	0	0	0	0
October 3-4, 1977	0	0	0	0	0	0
October 10-11, 1977	2	0	0	0	1	0
October 17-18, 1977	0	0	0	0	0	0
October 24-25, 1977	0	0	0	0	0	0
October 31-November 1, 1977	0	0	0	0	0	0

TABLE 5-6

CALCULATED FISH EGG AND LARVAL DENSITIES IN PUMP SAMPLES COLLECTED AT
DIFFERENT TIMES OF THE DAY AT U.S. STEEL CORPORATION GARY
WORKS LAKESIDE PUMPHOUSE FROM APRIL 6 THROUGH NOVEMBER 1, 1977

Collection Date	Number of Eggs and Larvae per 1000 Cubic Meters					
	~1000 to 1800 Hrs		~1800 to 0200 Hrs		~0200 to 1000 Hrs	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
April 6-7, 1977	0	0	0	0	0	0
April 14-15, 1977	0	0	0	0	0	0
April 21-22, 1977	0	0	0	0	0	0
April 28-29, 1977	0	3	0	0	0	0
May 5-6, 1977	0	0	0	0	0	0
May 12-13, 1977	0	0	3	0	14	0
May 19-20, 1977	0	0	0	0	0	0
May 26-27, 1977	0	0	0	0	363	0
May 31-June 1, 1977	28	0	1146	6	1563	3
June 6-7, 1977	1557	50	0	49	526	35
June 13-14, 1977	317	6	842	32	1282	3
June 20-21, 1977	259	9	1201	7	1563	3
June 27-28, 1977	769	0	977	13	2567	0
July 5-6, 1977	290	0	1514	7	5671	7
July 10-11, 1977	500	3	3465	3	7898	3
July 18-19, 1977	1816	0	849	0	3898	0
July 25-26, 1977	2215	3	3942	25	3146	6
August 1-2, 1977	56	3	24	10	1359	14
August 8-9, 1977	0	0	25	4	269	30
August 15-16, 1977	0	7	0	3	27	3
August 22-23, 1977	0	3	0	3	163	7
August 29-30, 1977	0	3	0	0	0	0
September 6-7, 1977	0	10	0	7	0	0
September 12-13, 1977	0	0	0	0	0	0
September 19-20, 1977	0	0	6	0	0	7
September 26-27, 1977	0	0	0	0	0	0
October 3-4, 1977	0	0	0	0	0	0
October 10-11, 1977	0	0	0	3	0	0
October 17-18, 1977	0	0	0	0	0	0
October 24-25, 1977	0	0	0	0	0	0
October 31-November 1, 1977	0	0	0	0	0	0

SECTION 6.0

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APPENDIX A

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC
GARY WORKS LAKESIDE PUMPHOUSE INTAKE

TABLE A-1

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM JANUARY 27 AT 1245 HOURS TO JANUARY 28 AT 1245 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)</u>
No fish collected				

TABLE A-2

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM FEBRUARY 24 AT 1220 HOURS TO FEBRUARY 25 AT 1220 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Mottled sculpin	2	66.67	5.8	81.69
Rainbow smelt	<u>1</u>	33.33	<u>1.3</u>	18.31
TOTAL	3		7.1	

* Percent of total number collected

** Percent of total biomass

TABLE A-3

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM MARCH 17 AT 1215 HOURS TO MARCH 18 AT 1210 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Mottled sculpin	2	100	8.8	100

* Percent of total number collected

** Percent of total biomass

TABLE A-4

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM APRIL 6 AT 1040 HOURS TO APRIL 7 AT 1040 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Johnny darter	1	20	2.5	14.12
Mottled sculpin	2	40	9.2	51.98
Sculpin	1	20	5.5	31.07
Rainbow smelt	<u>1</u>	20	<u>0.5</u>	2.83
TOTAL	5		17.7	

* Percent of total number collected

** Percent of total biomass

TABLE A-5

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM APRIL 14 AT 1000 HOURS TO APRIL 15 AT 1000 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	1	16.67	48.6	65.50
Mottled sculpin	4	66.66	23.1	31.13
Rainbow smelt	<u>1</u>	16.67	<u>2.5</u>	3.37
TOTAL	6		74.2	

* Percent of total number collected

** Percent of total biomass

TABLE A-6

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM APRIL 21 AT 1000 HOURS TO APRIL 22 AT 1000 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)</u>
No fish collected				

TABLE A-7

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM APRIL 28 AT 1000 HOURS TO APRIL 29 AT 1000 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	2	25.0	48.4	55.38
Mottled sculpin	4	50.0	33.3	38.10
Ninespine stickleback	1	12.5	4.6	5.26
Rainbow smelt	<u>1</u>	12.5	<u>1.1</u>	1.26
TOTAL	8		87.4	

* Percent of total number collected

** Percent of total biomass

TABLE A-8

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM MAY 5 AT 1000 HOURS TO MAY 6 AT 1000 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	6	75	292.5	94.94
Mottled sculpin	<u>2</u>	25	<u>15.6</u>	5.06
	8		308.1	

* Percent of total number collected

** Percent of total biomass

TABLE A-9

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM MAY 12 AT 1000 HOURS TO MAY 13 AT 1000 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	29	87.88	996.1	94.44
Mottled sculpin	1	3.03	11.0	1.04
Slimy sculpin	1	3.03	9.1	0.86
Spoonhead sculpin	1	3.03	6.5	0.63
Trout-perch	<u>1</u>	3.03	<u>32.0</u>	3.03
TOTAL	33		1054.7	

* Percent of total number collected

** Percent of total biomass

TABLE A-10

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM MAY 19 AT 0945 HOURS TO MAY 20 AT 0945 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	5	50	205.1	80.09
Mottled sculpin	1	10	9.5	3.71
Slimy sculpin	1	10	7.9	3.08
Spoonhead sculpin	2	20	13.0	5.08
Trout-perch	<u>1</u>	10	<u>20.6</u>	8.04
TOTAL	10		256.1	

* Percent of total number collected

** Percent of total biomass

TABLE A-11

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM MAY 26 AT 1000 HOURS TO MAY 27 AT 1000 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	7	87.50	237.5	98.10
Johnny darter	<u>1</u>	12.50	<u>4.6</u>	1.90
TOTAL	8		242.1	

* Percent of total number collected

** Percent of total biomass

TABLE A-12

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM MAY 31 AT 0945 HOURS TO JUNE 1 AT 0600 HOURS*

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) **</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) †</u>
Alewife	5	83.33	144.4	98.57
Ninespine stickleback	<u>1</u>	16.67	<u>2.1</u>	1.43
TOTAL	6		146.5	

* Malfunction of one traveling screen terminated collection at 20 hours

** Percent of total number collected

† Percent of total biomass

TABLE A-13

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM JUNE 6 AT 0930 HOURS TO JUNE 7 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) **</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	5	50	151.1	93.85
Ninespine stickleback	3	30	8.0	4.97
Trout-perch	<u>2</u>	20	<u>1.9</u>	1.18
TOTAL	10		161.0	

* Percent of total number collected

** Percent of total biomass

TABLE A-14

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM JUNE 13 AT 1000 HOURS TO JUNE 14 AT 1000 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	35	92.10	926.9	97.40
Ninespine stickleback	2	0.21	4.1	0.43
Trout-perch	<u>1</u>	0.10	<u>20.6</u>	2.17
TOTAL	38		951.6	

* Percent of total number collected

** Percent of total biomass

TABLE A-15

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM JUNE 20 AT 0930 HOURS TO JUNE 21 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	21	95.45	529.3	96.34
Spottail shiner	<u>1</u>	4.55	<u>20.1</u>	3.66
TOTAL	22		549.4	

* Percent of total number collected

** Percent of total biomass

TABLE A-16

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM JUNE 28 AT 1000 HOURS TO JUNE 29 AT 0945 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	12	92.31	326.7	99.24
Ninespine stickleback	<u>1</u>	7.69	<u>2.5</u>	00.76
TOTAL	13		329.2	

* Percent of total number collected

** Percent of total biomass

TABLE A-17

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM JULY 5, 1977 AT 1000 HOURS TO JULY 6, 1977 AT 1000 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	2	66.67	56.7	86.7
Trout-perch	<u>1</u>	33.33	<u>8.7</u>	13.3
TOTAL	3		65.4	

* Percent of total number collected

** Percent of total biomass

TABLE A-18

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM JULY 11, 1977 AT 0930 HOURS TO JULY 12, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	8	61	196.8	62.5
Slimy sculpin	1	8	7.4	2.3
Trout-perch	3	23	23.9	7.6
Yellow perch	<u>1</u>	8	<u>86.9</u>	27.6
TOTAL	13		315.0	

* Percent of total number collected

** Percent of total biomass

TABLE A-19

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM JULY 18, 1977 AT 0930 HOURS TO JULY 19, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	3	33.3	81.5	65.0
Spoonhead sculpin	1	11.1	3.3	2.6
Trout-perch	<u>5</u>	55.6	<u>40.6</u>	32.4
TOTAL	9		125.4	

* Percent of total number collected

** Percent of total biomass

TABLE A-20

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM JULY 25, 1977 AT 0915 HOURS TO JULY 26, 1977 AT 0915 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	5	62.5	142.1	99.2
Johnny darter	1	12.5	1.0	0.7
Rainbow smelt	<u>2</u>	25.0	<u>0.2</u>	0.1
TOTAL	8		143.3	

* Percent of total number collected

** Percent of total biomass

TABLE A-21

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE PUMPHOUSE FROM AUGUST 1, 1977 AT 0915 HOURS TO AUGUST 2, 1977 AT 0915 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	5	50	149.7	77.0
Johnny darter	1	10	1.7	0.9
Spoonhead sculpin	2	20	11.3	16.3
Trout-perch	<u>2</u>	20	<u>31.9</u>	5.8
TOTAL	10		194.6	

* Percent of total number collected

** Percent of total biomass

TABLE A-22

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM AUGUST 8, 1977 AT 0930 HOURS TO AUGUST 9, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	1	3.8	22.4	21.0
Mottled sculpin	1	3.8	6.9	6.5
Rainbow smelt	20	77.0	3.2	3.0
Trout-perch	3	11.6	21.4	20.1
Yellow perch	<u>1</u>	3.8	<u>52.6</u>	49.4
TOTAL	26		106.5	

* Percent of total number collected

** Percent of total biomass

TABLE A-23

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM AUGUST 15, 1977 AT 1015 HOURS TO AUGUST 16, 1977 AT 1015 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Mottled sculpin	2	14.3	2.0	7.5
Rainbow smelt	11	78.6	19.3	72.0
Trout-perch	<u>1</u>	7.1	<u>5.5</u>	20.5
TOTAL	14		26.8	

* Percent of total number collected

** Percent of total biomass

TABLE A-24

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM AUGUST 22, 1977 AT 0920 HOURS TO AUGUST 23, 1977 AT 0920 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Rainbow smelt	3	100	0.5	100

* Percent of total number collected

** Percent of total biomass

TABLE A-25

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM AUGUST 29, 1977 AT 0930 HOURS TO AUGUST 30, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	2	18.2	65.1	96.9
Rainbow smelt	<u>9</u>	81.8	<u>2.1</u>	3.1
TOTAL	11		67.2	

* Percent of total number collected

** Percent of total biomass

TABLE A-26

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM SEPTEMBER 6, 1977 AT 0930 HOURS TO SEPTEMBER 7, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	1	16.7	38.7	68.7
Rainbow smelt	3	50.0	0.9	1.6
Trout-perch	<u>2</u>	33.3	<u>16.7</u>	29.7
TOTAL	6		56.3	

* Percent of total number collected

** Percent of total biomass

TABLE A-27

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM SEPTEMBER 12, 1977 AT 0930 HOURS TO SEPTEMBER 13, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Johnny darter	1	50	2.4	15.5
Trout-perch	<u>1</u>	50	<u>13.1</u>	84.5
TOTAL	2		15.5	

* Percent of total number collected

** Percent of total biomass

TABLE A-28

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM SEPTEMBER 19, 1977 AT 0930 HOURS TO SEPTEMBER 20, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Rainbow smelt	2	50	1.1	8.0
Trout-perch	<u>2</u>	50	<u>12.7</u>	92.0
TOTAL	4		13.8	

* Percent of total number collected

** Percent of total biomass

TABLE A-29

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM SEPTEMBER 26, 1977 AT 0930 HOURS TO SEPTEMBER 27, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Rainbow smelt	2	100	1.4	100

* Percent of total number collected

** Percent of total biomass

TABLE A-30

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM OCTOBER 3, 1977 AT 0930 HOURS TO OCTOBER 4, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	21	3.4	43.1	9.1
Rainbow smelt	585 [†]	95.3	396.6	83.9
Trout-perch	5	0.8	21.6	4.6
Yellow perch	<u>3</u>	0.5	<u>11.3</u>	2.4
TOTAL	614		472.6	

* Percent of total number collected

** Percent of total biomass

[†] Includes an estimated 555 fish

TABLE A-31

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM OCTOBER 10, 1977 AT 0930 HOURS TO OCTOBER 11, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	2	3.6	24.6	38.4
Rainbow smelt	51	91.0	30.3	47.4
Trout-perch	<u>3</u>	5.4	<u>9.1</u>	14.2
TOTAL	56		64.0	

* Percent of total number collected

** Percent of total biomass

TABLE A-32

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM OCTOBER 17, 1977 AT 0920 HOURS TO OCTOBER 18, 1977 AT 0920 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	19	13.8	67.3	44.5
Johnny darter	1	0.7	0.4	0.3
Rainbow smelt	109	79.0	76.3	50.5
Spottail shiner	1	0.7	1.6	1.1
Trout-perch	<u>8</u>	5.8	<u>5.5</u>	3.6
TOTAL	138		151.1	

* Percent of total number collected

** Percent of total biomass

TABLE A-33

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM OCTOBER 24, 1977 AT 0930 HOURS TO OCTOBER 25, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	3	5.1	5.8	10.1
Rainbow smelt	54	91.5	47.2	81.9
Yellow perch	<u>2</u>	3.4	<u>4.6</u>	8.0
TOTAL	59		57.6	

* Percent of total number collected

** Percent of total biomass

TABLE A-34

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPSIDE FROM OCTOBER 31, 1977 AT 0900 HOURS TO NOVEMBER 1, 1977 AT 0900 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Rainbow smelt	29	100	24.7	100

* Percent of total number collected

** Percent of total biomass

TABLE A-35

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPHOUSE FROM NOVEMBER 10, 1977 AT 0930 HOURS TO NOVEMBER 11, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	2	66.7	34.2	98.8
Rainbow smelt	<u>1</u>	33.3	<u>0.4</u>	1.2
TOTAL	3		34.6	

* Percent of total number collected

** Percent of total biomass

TABLE A-36

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE
PUMPSIDE FROM DECEMBER 8, 1977 AT 0930 HOURS TO DECEMBER 9, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	141	68.4	4809.8	98.3
Rainbow smelt	51	24.8	50.6	1.0
Spottail shiner	1	0.5	1.2	0.02
Trout-perch	11	5.3	30.3	0.62
Yellow perch	<u>2</u>	1.0	<u>2.7</u>	0.06
TOTAL	206		4894.6	

* Percent of total number collected

** Percent of total biomass

APPENDIX B.

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC
GARY WORKS NO. 1 PUMPHOUSE INTAKE

TABLE B-1

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM JANUARY 27 AT 1230 HOURS TO JANUARY 28 AT 1230 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Black bullhead	1	2.04	227.0	70.63
Mottled sculpin	7	14.29	39.5	12.29
Rainbow smelt	35	71.43	48.7	15.15
Spottail shiner	4	8.16	5.5	1.71
Trout-perch	<u>2</u>	4.08	<u>0.7</u>	0.22
TOTAL	49		321.4	

* Percent of total number collected

** Percent of total biomass

TABLE B-2

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM FEBRUARY 24 AT 1245 HOURS TO FEBRUARY 25 AT 1245 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Gizzard shad	1	4.0	235.1	51.02
Mottled scuplin	1	4.0	4.8	1.04
Rainbow smelt	7	28.0	7.0	1.52
Spottail shiner	<u>16</u>	64.0	<u>213.9</u>	46.42
TOTAL	25		460.8	

* Percent of total number collected

** Percent of total biomass

TABLE B-3

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM MARCH 17 AT 1245 HOURS TO MARCH 18 AT 1245 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	8	5.93	408.0	16.81
Carp	1	0.72	1759.2	72.48
Mottled sculpin	6	4.44	39.1	1.61
Rainbow smelt	71	52.57	86.3	3.56
Spottail shiner	46	34.07	97.0	4.00
Trout-perch	<u>3</u>	2.20	<u>37.7</u>	1.54
TOTAL	135		2427.3	

* Percent of total number collected

** Percent of total biomass

TABLE B-4

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM APRIL 6 AT 1005 HOURS TO APRIL 7 AT 1105 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	3205 [†]	98.22	120790.3	99.90
Mottled sculpin	1	0.03	2.7	<0.01
Rainbow smelt	53	1.62	82.4	0.06
Spottail shiner	3	0.09	31.2	0.02
Trout-perch	<u>1</u>	0.03	<u>10.0</u>	<0.01
TOTAL	3263		120916.6	

* Percent of total number collected

** Percent of total biomass

† Includes an estimated 3175 fish

TABLE B-5

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM APRIL 14 AT 1040 HOURS TO APRIL 15 AT 1040 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	14403†	99.65	587832.2	99.95
Bluntnose minnow	1	<0.01	2.0	<0.01
Johnny darter	1	<0.01	1.2	<0.01
Mottled sculpin	1	<0.01	15.9	<0.01
Ninespine stickleback	6	0.04	21.8	<0.01
Rainbow smelt	28	0.19	83.1	0.01
Spottail shiner	<u>13</u>	0.08	<u>145.8</u>	0.02
TOTAL	14453		588102.1	

* Percent of total number collected

** Percent of total biomass

† Includes 14351 estimated fish

TABLE B-6

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM APRIL 21 AT 1045 HOURS TO APRIL 22 AT 1045 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	17603+	98.98	658018.4	99.80
Johnny darter	3	0.02	4.5	<0.01
Mottled sculpin	11	0.06	75.4	0.01
Ninespine stickleback	19	0.11	59.5	<0.01
Rainbow smelt	63	0.39	286.8	0.04
Slimy sculpin	1	0.01	10.7	<0.01
Spottail shiner	80	0.45	783.3	0.12
Trout-perch	2	0.01	0.4	<0.01
Yellow perch	<u>2</u>	0.01	<u>110.9</u>	0.02
TOTAL	17784		659349.9	

* Percent of total number collected

** Percent of total biomass

+ Includes an estimated 17461 fish

TABLE B-7

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM APRIL 28 AT 1045 HOURS TO APRIL 29 AT 1045 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	20162 [†]	99.05	752746.5	99.70
Black bullhead	1	<0.01	255.9	0.03
Johnny darter	3	0.01	5.1	<0.01
Mottled sculpin	6	0.03	61.3	0.01
Ninespine stickleback	39	0.19	132.4	0.02
Rainbow smelt	61	0.30	551.7	0.07
Spottail shiner	80	0.39	1061.2	0.14
Trout-perch	1	<0.01	13.5	<0.01
Yellow perch	3	0.01	168.8	0.02
TOTAL	20356		754996.4	

* Percent of total number collected

** Percent of total biomass

† Includes an estimated 20010 fish

TABLE B-8

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM MAY 5 AT 1020 HOURS TO MAY 6 AT 1040 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	11861 [†]	99.33	437312.1	99.83
Johnny darter	3	0.03	3.6	<0.01
Mottled sculpin	16	0.13	201.4 ^{††}	0.05
Ninespine stickleback	16	0.13	53.5	0.01
Rainbow smelt	22	0.18	245.3	0.06
Spottail shiner	21	0.18	206.0	0.05
Trout-perch	2	0.02	14.9	<0.01
TOTAL	11941		438036.8	

* Percent of total number collected

** Percent of total biomass

† Includes an estimated 11584 fish

†† Mostly gravid females

Alewife may 5,551.6

TABLE B-9

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM MAY 12 AT 1030 HOURS TO MAY 13 AT 1030 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	10601 [†]	97.10	356386.4 ^{††}	99.49
Johnny darter	25	0.23	38.1	0.01
Mottled sculpin	11	0.10	100.5	0.03
Ninespine stickleback	136	1.25	389.6	0.11
Rainbow smelt	38	0.35	104.2	0.03
Spottail shiner	103	0.94	1145.0	0.32
Trout-perch	4	0.04	52.0	0.01
TOTAL	10918		358215.8	

* Percent of total number collected

** Percent of total biomass

† Includes an estimated 10,436 fish

†† An additional 64751.7 grams of rotten fish were collected that apparently died prior to impingement on traveling screens.

TABLE B-10

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM MAY 19 AT 1030 HOURS TO MAY 20 AT 1030 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	1554 [†]	88.00	60471.4	97.18
Black bullhead	1	0.06	150.4	0.24
Johnny darter	16	0.91	30.2	0.05
Longnose dace	1	0.06	1.4	<0.01
Mottled sculpin	11	0.62	69.5	0.11
Ninespine stickleback	61	3.45	176.4	0.28
Rainbow smelt	8	0.45	45.4	0.07
Slimy sculpin	3	0.16	11.5	0.02
Spottail shiner	107	6.07	1226.4	1.97
Trout-perch	3	0.16	39.7	0.06
Yellow perch	<u>1</u>	0.06	<u>5.7</u>	0.01
TOTAL	1766		62228.0	

* Percent of total number collected

** Percent of total biomass

† Includes an estimated 1472 fish

TABLE B-11

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM MAY 26 AT 1035 HOURS TO MAY 27 AT 1035 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	2212 [†]	86.98	68628.9	95.00
Johnny darter	9	0.35	14.0	0.02
Lake trout	1	0.04	1248.5	1.73
Longnose dace	1	0.04	1.8	<0.01
Mottled sculpin	6	0.24	41.7	0.06
Ninespine stickleback	128	5.03	342.1	0.47
Rainbow smelt	7	0.28	126.6	0.18
Rainbow trout	2	0.08	26.6	0.04
Slimy sculpin	6	0.24	22.0	0.03
Spottail shiner	68	2.67	668.1	0.92
Trout-perch	102	4.01	1113.2	1.54
Yellow perch	<u>1</u>	0.04	<u>8.0</u>	0.01
TOTAL	2543		72241.5	

* Percent of total number collected

** Percent of total biomass

† Includes an estimated 2104 fish

TABLE B-12

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM MAY 31 AT 1045 HOURS TO JUNE 1 AT 1045 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	1530†	91.84	43751.2	97.47
Golden shiner	1	0.06	2.2	< 0.01
Johnny darter	4	0.24	5.1	0.01
Mottled sculpin	7	0.42	42.8	0.10
Ninespine Stickleback	16	0.96	37.5	0.08
Rainbow smelt	2	0.12	27.5	0.06
Rainbow trout	1	0.06	9.9	0.02
Slimy sculpin	5	0.30	57.8	0.13
Spoonhead sculpin	1	0.06	2.3	0.01
Spottail shiner	49	2.94	415.9	0.93
Trout-perch	46	2.76	501.4	1.12
Yellow-perch	4	0.24	33.2	0.07
TOTAL	1666		44886.8	

* Percent of total number collected

** Percent of total biomass

† Includes estimated 1464 fish

TABLE B-13

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM JUNE 6 AT 1030 HOURS TO JUNE 7 AT 1030 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	1372 [†]	90.09	35810.8	95.96
Johnny darter	8	0.53	10.7	0.03
Mottled sculpin	2	0.13	23.3	0.06
Ninespine stickleback	15	0.98	37.5	0.10
Rainbow smelt	1	0.07	15.3	0.04
Rainbow trout	2	0.13	25.2	0.07
Slimy sculpin	10	0.67	43.3	0.12
Spottail shiner	42	2.76	471.8	1.26
Trout-perch	64	4.20	745.1	2.00
Yellow-perch	<u>7</u>		<u>137.0</u>	0.38
TOTAL	1523		37320.0	

* Percent of total number collected

** Percent of total biomass

[†] Includes an estimated 1278 fish

TABLE B-14

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM JUNE 13 AT 1030 HOURS TO JUNE 14 AT 1030 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	2999 [†]	96.25	74354.3	98.37
Johnny darter	3	0.10	6.5	0.01
Mottled sculpin	1	0.03	7.2	0.01
Ninespine stickleback	12	0.39	27.7	0.04
Rainbow trout	1	0.03	7.3	0.01
Slimy sculpin	6	0.19	37.8	0.05
Spottail shiner	34	1.09	336.6	0.45
Trout-perch	59	1.89	675.4	0.89
Yellow-perch	<u>1</u>	0.03	<u>132.1</u>	0.17
TOTAL	3116		75584.9	

* Percent of total number collected

** Percent of total biomass

[†] Includes an estimated 2823 fish

TABLE B-15

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM JUNE 20 AT 1030 HOURS TO JUNE 21 AT 1030 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	1972 [†]	97.38	54984.3	98.79
Johnny Darter	3	0.15	2.4	< 0.01
Mottled sculpin	3	0.15	10.2	0.02
Ninespine stickleback	2	0.10	5.8	0.01
Rainbow trout	1	0.05	15.2	0.03
Slimy sculpin	1	0.05	3.5	0.01
Spottail shiner	17	0.84	180.8	0.32
Trout-perch	22	1.09	223.7	0.40
Yellow perch	4	0.20	231.9	0.42
TOTAL	2025		55657.8	

* Percent of total number collected

** Percent of total biomass

[†] Includes an estimated 1918 fish

TABLE B-16

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM JUNE 27 AT 1030 HOURS TO JUNE 28 AT 1030 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%) *</u>	<u>Total Biomass (grams)</u>	<u>Percent (%) **</u>
Alewife	1052 [†]	88.33	27950.4	95.00
Johnny darter	45	3.79	40.9	0.15
Ninespine stickleback	1	0.08	2.9	0.01
Rainbow trout	2	0.17	42.7	0.15
Slimy sculpin	5	0.42	31.3	0.11
Spottail shiner	27	2.27	285.7	0.97
Trout-perch	41	3.44	348.5	1.18
Yellow-perch	18	1.51	718.5	2.44
TOTAL	1191		29420.9	

* Percent of total number collected

** Percent of total biomass

† Includes an estimated 1012 fish

TABLE B-17

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM JULY 5, 1977 AT 1040 HOURS TO JULY 6, 1977 AT 1040 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	38	24.20	929.6	35.21
Bowfin	1	0.63	362.0	13.71
Johnny darter	12	7.64	11.4	0.43
Mottled sculpin	1	0.63	2.6	0.10
Ninespine stickleback	1	0.63	2.8	0.11
Rainbow smelt	1	0.63	4.2	0.16
Slimy sculpin	2	1.27	24.5	0.93
Spottail shiner	13	8.28	150.6	5.70
Trout-perch	78	49.68	688.8	26.09
Yellow perch	<u>10</u>	6.37	<u>463.7</u>	17.56
TOTAL	157		2640.2	

* Percent of total number collected

** Percent of total biomass

TABLE B-18

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM JULY 11, 1977 AT 1015 HOURS TO JULY 12, 1977 AT 1015 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	892	78.18	23457.6	90.56
Bluegill sunfish	1	0.09	38.3	0.15
Channel catfish	1	0.09	34.7	0.13
Johnny darter	9	0.79	8.9	0.03
Lake trout	1	0.09	7.2	0.03
Ninespine stickleback	2	0.17	6.7	0.03
Slimy sculpin	3	0.26	41.2	0.16
Spottail shiner	29	2.54	276.3	1.07
Rock bass	1	0.09	248.7	0.96
Trout-perch	174	15.25	1323.6	5.11
Yellow perch	28	2.45	459.8	1.78
TOTAL	1141		25903.0	

* Percent of total number collected

** Percent of total biomass

TABLE B-19

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM JULY 18, 1977 AT 1015 HOURS TO JULY 19, 1977 AT 1015 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	1093	82.06	26656.7	94.00
Johnny darter	67	5.03	78.7	0.28
Mottled sculpin	1	0.07	3.3	0.01
Rainbow smelt	1	0.07	0.2	<0.01
Rainbow trout	1	0.07	17.9	0.06
Slimy sculpin	1	0.07	11.6	0.04
Spottail shiner	18	1.35	133.0	0.47
Trout-perch	125	9.38	627.7	2.21
Yellow perch	<u>25</u>	1.88	<u>828.9</u>	2.92
TOTAL	1332		28358.0	

* Percent of total number collected

** Percent of total biomass

TABLE B-20

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM JULY 25, 1977 AT 1020 HOURS TO JULY 26, 1977 AT 1020 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	432	63.72	10113.9	86.95
Black bullhead	2	0.29	1.7	0.01
Bluegill	1	0.15	26.8	0.23
Coho salmon	3	0.44	82.1	0.71
Emerald shiner	1	0.15	7.1	0.06
Johnny darter	58	8.55	73.6	0.63
Ninespine stickleback	3	0.44	0.9	0.01
Rainbow smelt	17	2.51	2.6	0.02
Slimy sculpin	2	0.29	16.9	0.15
Spoonhead sculpin	1	0.15	1.8	0.02
Spottail shiner	9	1.33	96.9	0.83
Trout-perch	134	19.76	589.6	5.07
Yellow perch	<u>15</u>	2.21	<u>617.7</u>	5.31
TOTAL	678		11631.6	

* Percent of total number collected

** Percent of total biomass

TABLE B-21

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM AUGUST 1, 1977 AT 1000 HOURS TO AUGUST 2, 1977 AT 1000 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	70	37.84	1548.3	66.11
Johnny darter	47	25.40	64.1	2.74
Mottled sculpin	10	5.40	69.7	2.98
Ninespine stickleback	2	1.08	1.0	0.04
Rainbow smelt	1	0.54	0.3	0.01
Spottail shiner	6	3.24	56.9	2.43
Trout-perch	27	14.59	108.2	4.62
Yellow perch	<u>22</u>	11.89	<u>493.5</u>	21.07
TOTAL	185		2342.0	

* Percent of total number collected

** Percent of total biomass

TABLE B-22

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM AUGUST 8, 1977 AT 1030 HOURS TO AUGUST 9, 1977 AT 1030 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	40	13.79	763.5	44.15
Johnny darter	56	19.31	86.1	4.98
Longnose dace	1	0.34	4.8	0.28
Mottled sculpin	3	1.03	36.3	1.75
Rainbow smelt	2	0.69	0.3	0.01
Spottail shiner	10	3.45	31.8	1.84
Trout-perch	24	8.28	92.0	5.32
Yellow perch	<u>154</u>	53.10	<u>720.7</u>	41.67
TOTAL	290		1729.5	

* Percent of total number collected

** Percent of total biomass

TABLE B-23

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM AUGUST 15, 1977 AT 1015 HOURS TO AUGUST 16, 1977 AT 1015 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	28	24.14	661.8	41.16
Coho salmon	1	0.86	20.4	1.27
Golden shiner	1	0.86	7.2	0.45
Johnny darter	32	27.59	47.6	2.96
Rainbow smelt	8	6.90	1.5	0.09
Spottail shiner	5	4.31	31.9	1.98
Trout-perch	11	9.48	49.5	3.08
Yellow perch	<u>30</u>	25.86	<u>788.1</u>	49.01
TOTAL	116		1608.0	

* Percent of total number collected

** Percent of total biomass

TABLE B-24

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM AUGUST 22, 1977 AT 0950 HOURS TO AUGUST 23, 1977 AT 0950 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	77	22.65	2032.6	52.18
Coho salmon	1	0.29	23.6	0.61
Gizzard shad	2	0.59	16.5	0.42
Johnny darter	24	7.06	36.2	0.93
Mottled sculpin	3	0.88	16.7	0.43
Rainbow smelt	8	2.35	0.8	0.02
Spottail shiner	15	4.41	116.6	2.99
Trout-perch	52	15.29	169.5	4.35
Yellow perch	<u>158</u>	46.47	<u>1482.8</u>	38.07
TOTAL	340		3895.3	

* Percent of total number collected

** Percent of total biomass

TABLE B-25

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM AUGUST 29, 1977 AT 1015 HOURS TO AUGUST 30, 1977 AT 1015 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	384 [†]	69.06	3406.0	48.49
Carp	1	0.18	2752.4	39.18
Johnny darter	4	0.72	7.5	0.11
Mottled sculpin	1	0.18	5.5	0.08
Rainbow smelt	35	6.29	16.5	0.23
Spottail shiner	27	4.86	234.2	3.33
Trout-perch	49	8.81	257.2	3.66
Yellow perch	<u>55</u>	9.89	<u>344.9</u>	4.91
TOTAL	556		7024.2	

* Percent of total number collected

** Percent of total biomass

[†] Includes an estimated 241 fish

TABLE B-26

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM SEPTEMBER 6, 1977 AT 0930 HOURS TO SEPTEMBER 7, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	114	48.10	959.1	60.37
Johnny darter	5	2.11	7.4	0.47
Mottled sculpin	2	0.84	23.0	1.45
Rainbow smelt	54	22.78	22.5	1.42
Spottail shiner	12	5.06	107.1	6.74
Trout-perch	24	10.13	164.7	10.38
Yellow perch	<u>26</u>	10.97	<u>304.8</u>	19.17
TOTAL	237		1588.6	

* Percent of total number collected

** Percent of total biomass

TABLE B-27

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM SEPTEMBER 12, 1977 AT 1010 HOURS TO SEPTEMBER 13, 1977 AT 1010 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	35	31.82	615.7	32.02
Johnny darter	13	11.82	27.6	1.44
Mottled sculpin	3	2.73	23.3	1.21
Rainbow smelt	4	3.64	27.6	1.44
Spoonhead sculpin	1	0.91	3.4	0.18
Spottail shiner	8	7.27	61.2	3.18
Trout-perch	25	22.73	182.1	9.47
Yellow perch	<u>21</u>	19.09	<u>982.2</u>	51.07
TOTAL	110		1923.1	

* Percent of total number collected

** Percent of total biomass

TABLE B-28

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM SEPTEMBER 19, 1977 AT 0930 HOURS TO SEPTEMBER 20, 1977 AT 0930 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	4952 [†]	97.14	8214.4	88.83
Johnny darter	12	0.24	26.4	0.29
Mottled sculpin	8	0.16	48.0	0.52
Rainbow smelt	19	0.37	41.9	0.45
Spottail shiner	15	0.29	109.7	1.19
Trout-perch	66	1.29	363.9	3.94
Yellow perch	<u>26</u>	0.51	<u>443.2</u>	4.79
TOTAL	5098		9247.5	

* Percent of total number collected

** Percent of total biomass

[†] Includes an estimated 4863 fish

TABLE B-29

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM SEPTEMBER 26, 1977 AT 1015 HOURS TO SEPTEMBER 27, 1977 AT 1015 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	1314 [†]	77.25	5119.0	69.74
Chinook salmon	1	0.06	42.8	0.58
Emerald shiner	2	0.12	12.2	0.17
Gizzard shad	4	0.24	34.1	0.46
Johnny darter	9	0.53	20.7	0.28
Mottled sculpin	4	0.24	39.3	0.54
Rainbow smelt	146	8.58	172.1	2.34
Spottail shiner	85	5.00	359.6	4.90
Trout-perch	47	2.76	244.6	3.33
Yellow perch	<u>89</u>	5.23	<u>1296.2</u>	17.66
TOTAL	1701		7340.6	

* Percent of total number collected

** Percent of total biomass

[†] Includes an estimated 1173 fish

TABLE B-30

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM OCTOBER 3, 1977 AT 1000 HOURS TO OCTOBER 4, 1977 AT 1000 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	242	13.07	1431.6	33.54
Bluegill	1	0.05	3.9	0.09
Chinook salmon	1	0.05	60.8	1.42
Gizzard shad	18	0.97	224.3	5.25
Johnny darter	13	0.70	21.8	0.51
Largemouth bass	1	0.05	7.9	0.19
Longnose dace	2	0.11	5.6	0.13
Mottled sculpin	2	0.11	21.2	0.50
Ninespine stickleback	1	0.05	0.1	<0.01
Rainbow smelt	1429 [†]	77.16	1178.0	27.60
Rainbow trout	1	0.05	387.7	9.08
Smallmouth bass	1	0.05	2.7	0.06
Spoonhead sculpin	1	0.05	2.8	0.07
Spottail shiner	41	2.21	251.0	5.88
Trout-perch	22	1.19	131.0	3.07
Warmouth	1	0.05	35.2	0.82
Yellow perch	<u>75</u>	4.05	<u>503.2</u>	11.79
TOTAL	1852		4268.8	

* Percent of total number collected

** Percent of total biomass

[†] Includes an estimated 1397 fish

TABLE B-31

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM OCTOBER 10, 1977 AT 1020 HOURS TO OCTOBER 10, 1977 AT 1020 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	157	10.75	381.4	22.66
Bluegill	4	0.27	17.7	1.05
Gizzard shad	2	0.12	10.8	0.64
Johnny darter	4	0.27	8.1	0.48
Rainbow smelt	1250 [†]	85.56	1065.1	63.27
Spottail shiner	28	1.92	119.1	7.07
Trout-perch	10	0.68	59.5	3.53
Yellow perch	6	0.41	21.6	1.29
TOTAL	1461		1683.4	

* Percent of total number collected

** Percent of total biomass

[†] Includes an estimated 1220 fish

TABLE B-32

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM OCTOBER 17, 1977 AT 1015 HOURS TO OCTOBER 18, 1977 AT 1015 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	1072 [†]	40.21	1942.9	47.79
Bluegill	1	0.04	3.6	0.09
Gizzard shad	14	0.53	194.6	4.79
Johnny darter	11	0.41	19.0	0.47
Longnose dace	1	0.04	2.5	0.06
Mottled sculpin	2	0.08	16.4	0.40
Ninespine stickleback	1	0.04	0.4	0.01
Rainbow smelt	1497 ^{††}	56.15	1556.8	38.29
Spottail shiner	22	0.83	91.6	2.25
Trout-perch	18	0.68	89.2	2.19
Yellow perch	22	0.83	136.6	3.36
Unidentified salmonid	<u>5</u>	0.19	<u>11.8</u>	0.29
TOTAL	2666		4065.4	

* Percent of total number collected

** Percent of total biomass

[†] Includes an estimated 1033 fish

^{††} Includes an estimated 1467 fish

TABLE B-33

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM OCTOBER 24, 1977 AT 1015 HOURS TO OCTOBER 25, 1977 AT 1015 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	45	27.78	224.8	32.88
Gizzard shad	5	3.09	147.7	21.60
Johnny darter	2	1.23	4.2	0.61
Mottled sculpin	2	1.23	19.7	2.88
Rainbow smelt	89	54.94	88.9	13.00
Spottail shiner	4	2.47	23.5	3.44
Trout-perch	2	1.23	13.8	2.02
Yellow perch	<u>13</u>	8.02	<u>161.2</u>	23.57
TOTAL	162		683.8	

* Percent of total number collected

** Percent of total biomass

TABLE B-34

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM OCTOBER 31, 1977 AT 0920 HOURS TO NOVEMBER 1, 1977 AT 0920 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	27	30.68	77.7	44.76
Gizzard shad	1	1.14	4.5	2.59
Johnny darter	1	1.14	1.9	1.09
Rainbow smelt	52	59.09	54.7	31.51
Spottail shiner	2	2.27	3.5	2.02
Trout-perch	2	2.27	18.5	10.66
Yellow perch	<u>3</u>	3.41	<u>12.8</u>	7.37
TOTAL	88		173.6	

* Percent of total number collected

** Percent of total biomass

TABLE B-35

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM NOVEMBER 10, 1977 AT 1000 HOURS TO NOVEMBER 11, 1977 AT 1000 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	308	22.05	2011.2	9.44
Bowfin	2	0.14	1901.2	8.93
Carp	1	0.07	5249.4	24.64
Gizzard shad	649	46.46	10399.3	48.82
Johnny darter	6	0.43	13.4	0.06
Mottled sculpin	1	0.07	18.1	0.08
Rainbow smelt	225	16.11	345.2	1.62
Spottail shiner	155	11.10	967.3	4.54
Trout-perch	17	1.22	156.3	0.74
Yellow perch	31	2.22	228.9	1.07
Unidentified salmonid	2	0.14	10.9	0.05
TOTAL	1397		21301.2	

* Percent of total number collected

** Percent of total biomass

TABLE B-36

SUMMARY OF FISH COLLECTED FROM TRAVELING SCREENS AT USSC GARY WORKS NO. 1
PUMPHOUSE FROM DECEMBER 8, 1977 AT 1000 HOURS TO DECEMBER 9, 1977 AT 1000 HOURS

<u>Common Name</u>	<u>Total Number</u>	<u>Percent (%)*</u>	<u>Total Biomass (grams)</u>	<u>Percent (%)**</u>
Alewife	136	14.75	2808.6	23.55
Gizzard shad	396	42.95	7854.5	65.85
Goldfish	1	0.11	148.2	1.24
Johnny darter	2	0.22	3.6	0.03
Mottled sculpin	1	0.11	16.1	0.13
Rainbow smelt	354	38.39	337.9	2.83
Spottail shiner	13	1.41	30.3	0.25
Trout-perch	7	0.76	28.3	0.24
White sucker	1	0.11	526.6	4.41
Yellow perch	9	0.98	165.3	1.39
Unidentified salmonids	2	0.22	7.7	0.06
TOTAL	922		11927.1	

* Percent of total number collected

** Percent of total biomass

APPENDIX C

LENGTH AND WEIGHT STATISTICS OF SELECT FISH SPECIES COLLECTED FROM
TRAVELING SCREENS AT USSC GARY WORKS LAKESIDE PUMPHOUSE INTAKE

TABLE C-1

LENGTH OF STATISTICS OF ALEWIVES COLLECTED FROM THE TRAVELING SCREENS
OF LAKESIDE PUMPHOUSE INTAKE AT USSC GARY WORKS

Date	Sample Size	Length in Centimeters			Standard Deviation	Variance	Confidence Limits	
		Minimum	Maximum	Mean			L ₁	L ₂
1/27-28/77	None collected							
2/24-25/77	None collected							
3/17-18/77	None collected							
4/6-7/77	None collected							
4/14-15/77	1	15.1	15.1	-	-	-	-	-
4/21-22/77	None collected							
4/28-29/77	2	7.1	14.1	10.6	4.9	12.2	-11.3	32.5
5/5-6/77	6	13.7	15.6	14.6	0.7	0.4	14.0	15.2
5/12-13/77	28	10.9	15.9	13.5	1.1	1.3	13.1	13.9
5/19-20/77	5	13.1	15.6	14.6	1.0	0.8	13.6	15.6
5/26-27/77	7	11.6	14.7	13.7	1.2	1.2	12.8	14.6
5/31-6/1/77	5	7.8	14.6	12.9	2.9	6.6	10.1	15.7
6/6-7/77	5	7.3	15.1	12.4	3.0	7.4	9.5	15.3
6/13-14/77	30	11.3	14.7	13.0	0.9	0.9	12.7	13.3
6/20-21/77	21	7.5	15.3	12.3	2.1	4.3	11.5	13.1
6/28-29/77	12	10.3	14.6	13.1	1.5	2.0	12.3	13.9
7/5-6/77	2	12.6	13.6	13.1	0.7	0.2	10.0	16.2
7/11-12/77	8	10.5	15.3	13.0	1.5	2.0	12.0	14.0
7/18-19/77	3	12.5	13.5	13.0	0.5	0.2	12.1	13.8
7/25-26/77	5	12.3	14.1	13.0	0.7	0.4	12.3	13.7
8/1-2/77	5			13.9	1.0	0.8	12.9	14.9
8/8-9/77	1	11.8	11.8	-	-	-	-	-
8/15-16/77	None collected							
8/22-23/77	None collected							
8/29-30/77	2	11.3	13.8	12.8	1.4	1.0	6.5	19.1
9/6-7/77	1	12.7	12.7	-	-	-	-	-
9/12-13/77	None collected							
9/19-20/77	None collected							
9/26-27/77	None collected							
10/3-4/77	21	2.8	13.2	4.6	2.1	4.2	3.8	5.4
10/10-11/77	2	3.8	12.7	8.2	6.3	19.8	-19.9	36.3
10/17-18/77	19	3.3	13.5	5.1	2.2	4.7	4.2	6.0
10/24-25/77	3	4.7	5.2	5.0	0.2	0.4	4.7	5.3
10/31-11/1/77	None collected							
11/10-11/77	2	6.6	12.4	9.5	4.1	8.4	-8.8	27.8
12/8-9/77	30	11.6	14.4	13.4	0.7	0.5	13.2	13.6

TABLE C-2

WEIGHT STATISTICS OF ALEWIVES COLLECTED FROM THE
TRAVELING SCREENS OF LAKESIDE PUMPHOUSE INTAKE AT USSC GARY WORKS

Date	Sample Size	Weight in Grams			Standard Deviation	Variance	Confidence Limits	
		Minimum	Maximum	Mean			L ₁	L ₂
1/27-28/77	None collected							
2/24-25/77	None collected							
3/17-18/77	None collected							
4/6-7/77	None collected							
4/14-15/77	1	48.6	48.6	-	-	-	-	-
4/21-22/77	None collected							
4/28-29/77	2		43.3	24.2	27.0	364.8	-31.6	80.0
5/5-6/77	6	44.9	53.4	48.7	3.9	12.9	45.6	51.8
5/12-13/77	29	17.6	60.5	34.3	8.9	8.9	31.5	37.1
5/19-20/77	5	27.8	52.6	41.0	8.8	62.5	33.0	49.0
5/31-6/1/77	5	28.4	38.0	28.9	13.3	142.4	16.9	40.9
6/6-7/77	5	5.7	44.0	30.2	15.4	190.9	16.3	44.1
6/13-14/77	30	18.1	40.5	28.1	4.9	22.9	26.6	29.6
6/20-21/77	21	5.7	41.2	25.2	9.7	90.4	21.5	28.9
6/28-29/77	11	13.7	44.3	29.7	9.7	86.0	24.4	35.0
7/5-6/77	2	27.8	28.9	28.3	0.8	0.3	26.7	29.9
7/11-12/77	8	15.5	34.5	24.6	5.9	30.2	20.7	28.5
7/18-19/77	3	20.1	33.2	27.2	6.0	24.0	19.0	35.3
7/25-26/77	5	24.7	34.4	28.4	4.9	19.3	22.7	34.1
8/1-2/77	5	15.9	43.9	29.9	11.4	103.4	49.5	40.2
8/8-9/77	1	22.4	22.4	-	-	-	-	-
8/15-16/77	None collected							
8/22-23/77	None collected							
8/29-30/77	2	23.2	41.9	32.5	13.2	87.4	5.2	59.8
9/6-7/77	1	38.7	38.7	-	-	-	-	-
9/12-13/77	None collected							
9/19-20/77	None collected							
9/26-27/77	None collected							
10/3-4/77	21	0.2	25.1	2.0	5.3	26.8	0.01	4.0
10/10-11/77	2	0.7	23.9	12.3	16.4	134.6	-21.6	46.2
10/17-18/77	19	0.4	40.4	3.5	9.0	76.2	-0.06	7.1
10/24-25/77	3	1.4	2.2	1.9	0.5	0.14	1.3	2.5
10/31-11/1/77	None collected							
11/10-11/77	2	3.0	31.2	17.1	19.9	198.8	-24.0	58.2
12/8-9/77	30*	33.4	62.0	63.2	82.8	6633.9	37.5	88.9
	30*	1.0	5.6	3.1	1.2	1.5	2.7	3.5

* Two size classes of fish collected

TABLE C-3

LENGTH STATISTICS OF RAINBOW SMELT COLLECTED FROM THE
TRAVELING SCREENS OF LAKESIDE PUMPHOUSE INTAKE AT USSC GARY WORKS

Date	Sample Size	Length in Centimeters			Standard Deviation	Variance	Confidence Limits	
		Minimum	Maximum	Mean			L ₁	L ₂
1/27-28/77	None collected							
2/24-25/77	1	5.4	5.4	-	-	-	-	-
3/17-18/77	None collected							
4/6-7/77	1	4.4	4.4	-	-	-	-	-
4/15-16/77	1	6.7	6.7	-	-	-	-	-
4/21-22/77	None collected							
4/28-29/77	1	5.1	5.1	-	-	-	-	-
5/5-6/77	None collected							
5/12-13/77	None collected							
5/19-20/77	None collected							
5/26-27/77	None collected							
5/31-6/1/77	None collected							
6/6-7/77	None collected							
6/13-14/77	None collected							
6/28-29/77	None collected							
7/5-6/77	None collected							
7/11-12/77	None collected							
7/18-19/77	None collected							
7/25-26/77	2	2.8	3.1	2.9	0.2	0.2	2.0	3.8
8/1-2/77	None collected							
8/8-9/77	20	3.1	3.6	3.3	0.1	0.02	3.3	3.3
8/15-16/77	11	2.7	3.6	3.3	0.3	0.6	3.1	3.5
8/22-23/77	3	3.1	3.3	3.2	0.1	0.01	3.0	3.4
8/29-30/77	9	3.1	4.2	3.4	0.3	0.1	3.2	3.6
9/6-7/77	3	3.4	4.1	3.7	0.3	0.8	3.2	4.2
9/12-13/77	None collected							
9/19-20/77	2	4.2	4.6	4.4	0.3	0.04	3.1	5.7
9/26-27/77	2	4.0	5.1	4.5	0.8	0.3	0.9	8.1
10/3-4/77	30	3.9	5.4	4.5	0.4	0.2	4.4	4.6
10/10-11/77	30	3.9	5.1	4.5	0.3	0.08	4.4	4.6
10/17-18/77	30	3.7	5.2	4.6	0.4	0.1	4.5	4.7
10/24-25/77	30	4.3	5.9	5.0	0.4	0.2	4.9	5.1
10/31-11/1/77	29	4.2	6.8	5.0	0.4	0.2	4.9	5.1
11/10-11/77	1	4.1	4.1	-	-	-	-	-
12/8-9/77	30	3.9	6.3	5.1	0.6	0.4	4.9	5.3

TABLE C-4

WEIGHT STATISTICS OF RAINBOW SMELT COLLECTED FROM THE
TRAVELING SCREENS OF LAKESIDE PUMPHOUSE INTAKE AT USSC GARY WORKS

Date	Sample Size	Weight in Grams			Standard Deviation	Variance	Confidence Limits	
		Minimum	Maximum	Mean			L ₁	L ₂
1/27-28/77	None collected							
2/24-25/77	1	1.3	1.3	-	-	-	-	-
3/17-18/77	None collected							
4/6-7/77	1	0.5	0.5	-	-	-	-	-
4/14-15/77	1	48.6	48.6	-	-	-	-	-
4/21-22/77	None collected							
4/28-29/77	1	1.1	1.1	-	-	-	-	-
5/5-6/77	None collected							
5/12-13/77	None collected							
5/19-20/77	None collected							
5/26-27/77	None collected							
5/31-6/1/77	None collected							
6/6-7/77	None collected							
6/13-14/77	None collected							
6/20-21/77	None collected							
6/28-29/77	None collected							
7/5-6/77	None collected							
7/11-12/77	None collected							
7/18-19/77	None collected							
7/25-26/77	2	0.1	0.1	0.1	0.0	0.0	0.1	0.1
8/1-2/77	None collected							
8/8-9/77	20	0.1	0.3	0.2	0.07	0.004	0.17	0.23
8/15-16/77	11	0.1	0.3	0.2	0.09	0.007	0.15	0.25
8/22-23/77	3	0.1	0.2	0.2	0.06	0.002	0.12	0.28
9/6-7/77	3	0.2	0.4	0.3	0.1	0.007	0.06	0.34
9/19-20/77	2	0.4	0.7	0.5	0.2	0.02	0.06	0.94
10/3-4/77	30	0.3	1.3	0.7	0.2	0.6	0.6	0.8
10/10-11/77	30	0.4	1.1	0.6	0.2	0.02	0.55	0.65
10/17-18/77	30	0.3	1.2	0.7	0.2	0.05	0.63	0.77
10/24-25/77	30	0.5	1.6	0.9	0.3	0.07	0.82	0.98
10/31-11/1/77	29	0.4	2.2	0.8	0.3	0.12	0.7	0.89
11/10-11/77	1	0.4	0.4	-	-	-	-	-
12/8-9/77	30	0.3	2.2	1.0	0.4	0.17	0.87	1.13

APPENDIX D

LENGTH AND WEIGHT STATISTICS OF SELECT FISH SPECIES COLLECTED FROM
TRAVELING SCREENS AT USSC GARY WORKS NO. 1 PUMPHOUSE INTAKE

TABLE D-1

LENGTH STATISTICS OF ALEWIVES COLLECTED FROM THE TRAVELING SCREENS
OF NO. 1 PUMPHOUSE INTAKE AT U.S.S.C. GARY WORKS

Date	Sample Size	Length in Centimeters			Standard Deviation	Variance	Confidence Limits	
		Minimum	Maximum	Mean			L ₁	L ₂
1/27-28/77	None Collected							
2/24-25/77	None Collected							
3/17-18/77	8	13.6	15.9	14.7	0.9	0.8	14.1	15.3
4/6-7/77	30	13.4	16.4	14.6	0.7	0.5	14.4	14.8
4/14-15/77	30*	13.3	17.0	14.7	1.0	0.9	14.4	15.0
	22*	6.4	10.2	8.7	0.9	0.8	8.4	9.0
4/21-22/77	30*	12.8	15.7	14.2	0.7	0.5	13.9	14.5
	30*	7.0	10.5	8.6	1.0	0.9	8.2	9.0
4/28-29/77	30*	12.8	15.4	14.3	0.7	0.5	14.0	14.6
	30*	7.3	11.7	8.7	1.0	0.9	8.3	9.1
5/5-6/77	30*	10.9	15.7	13.8	1.1	1.3	13.4	14.2
	30*	6.7	10.8	8.4	1.1	1.3	8.0	8.8
5/12-13/77	30*	11.6	16.5	13.6	1.2	1.5	13.2	14.0
	30*	6.7	9.9	8.5	0.9	0.8	8.2	8.8
5/19-20/77	30*	12.2	16.3	13.8	1.0	1.0	13.4	14.0
	30*	6.6	9.5	8.3	0.9	0.8	8.0	8.6
5/26-27/77	30*	11.0	16.0	13.6	1.3	1.8	13.2	14.1
	30*	7.0	11.0	8.9	1.2	1.5	8.5	9.3
5/31-6/1/77	30*	10.4	16.3	13.7	1.2	1.5	12.7	14.7
	30*	7.1	10.9	8.7	1.2	1.4	8.3	9.1
6/6-7/77	30*	11.8	15.8	13.6	0.9	0.8	13.3	13.9
	30*	6.1	11.1	8.5	1.1	1.2	8.1	8.9
6/13-14/77	30*	10.5	15.2	12.9	1.4	1.9	12.5	13.3
	30*	7.1	10.0	8.4	0.7	0.6	8.1	8.7
6/20-21/77	30*	11.2	15.9	13.2	1.1	1.3	12.8	13.6
	24*	6.7	10.0	8.5	0.8	0.6	8.2	8.8
6/27-28/77	30*	10.5	15.2	12.5	1.0	1.0	12.2	12.8
	10*	7.3	10.3	8.9	0.9	0.8	8.4	9.4
7/5-6/77	30*	10.5	15.9	13.0	1.3	1.7	12.6	13.4
	5*	6.9	9.3	8.4	0.9	0.9	7.5	9.3
7/11-12/77	30*	11.1	15.3	12.9	1.0	1.0	12.6	13.2
	2*	7.5	8.7	8.1	0.6	0.6	5.4	10.8
7/18-19/77	30*	10.8	14.7	12.7	1.1	1.3	12.4	13.0
	3*	8.2	9.5	8.7	0.7	0.5	7.5	9.9
7/25-26/77	30*	11.1	15.2	12.7	1.1	1.2	12.4	13.0
	11*	2.3	3.7	2.3	0.5	0.2	2.0	2.6
8/1-2/77	30*	10.4	15.7	12.6	1.1	1.2	11.6	13.6
	2*	3.0	3.4	3.2	0.3	0.1	1.9	4.5
8/8-9/77	30*	10.9	14.4	12.7	0.8	0.6	12.5	12.9
	7*	3.7	5.1	4.4	0.4	0.2	4.1	4.7
8/15-16/77	27	5.3	13.9	12.4	1.6	2.7	11.9	12.9
8/22-23/77	30	10.5	16.1	12.7	1.3	1.8	12.3	13.1
8/29-30/77	30*	9.0	16.2	12.5	1.6	2.4	12.0	13.0
	30*	2.3	5.6	3.8	0.7	0.4	3.6	4.0
9/6-7/77	30*	9.7	14.0	12.1	0.9	0.8	11.8	12.4
	30*	1.9	6.5	3.9	1.2	1.5	3.5	4.3
9/12-13/77	23*	9.8	13.9	12.4	0.9	0.7	12.1	12.7
	12*	2.8	6.8	4.7	0.9	0.9	4.2	5.2
9/19-20/77	30*	10.4	14.8	12.6	1.0	1.1	12.3	12.9
	30*	2.1	5.8	4.6	0.7	0.5	4.4	4.8
9/26-27/77	30*	10.9	15.7	12.4	1.1	1.3	12.1	12.7
	30*	3.7	5.0	4.3	0.4	0.1	4.2	4.4
10/3-4/77	30*	9.6	14.8	12.3	1.3	1.7	11.9	12.7
	30*	2.6	6.6	4.5	1.0	1.0	4.2	4.8
10/10-11/77	6*	9.3	13.9	12.7	1.7	3.0	11.3	14.1
	30*	2.6	5.5	4.1	0.9	0.7	3.8	4.4
10/17-18/77	9*	11.5	15.7	12.8	1.3	1.6	12.0	13.6
	30*	2.8	6.7	4.7	1.0	1.1	4.4	5.0
10/24-25/77	3*	13.6	14.1	13.8	0.3	0.1	13.3	14.3
	30*	3.5	6.6	4.7	0.9	0.8	4.4	5.0
10/31-11/1/77	26	2.8	14.1	4.8	2.1	4.4	4.1	5.5
11/10-11/77	30*	10.6	15.4	12.8	1.2	1.5	12.4	13.2
	30*	3.5	6.9	5.0	1.0	1.0	4.7	5.3
12/8-9/77	30*	10.8	14.3	12.4	0.8	0.6	12.2	12.6
	30*	4.4	8.4	6.5	1.0	1.0	6.2	6.8

* Two size classes of fish collected

TABLE D-2

LENGTH STATISTICS OF RAINBOW SMELT COLLECTED FROM THE TRAVELING SCREENS
OF NO. 1 PUMPHOUSE INTAKE AT USSC GARY WORKS

Date	Sample Size	Length in Centimeters			Standard Deviation	Variance	Confidence Limits	
		Minimum	Maximum	Mean			L ₁	L ₂
1/27-28/77	30	3.6	10.4	5.3	1.2	1.4	4.9	5.7
2/24-25/77	7	4.0	6.6	5.2	0.8	0.5	4.6	5.8
3/17-18/77	30	3.9	7.9	5.3	0.8	0.7	5.1	5.5
4/6-7/77	30	4.3	7.4	5.6	0.9	0.9	5.3	5.9
4/14-15/77	27	4.5	13.6	6.0	1.8	3.1	5.4	6.6
4/21-22/77	30	4.5	8.0	6.3	1.0	1.0	6.0	6.6
4/28-29/77	29*	4.7	8.2	6.4	0.9	0.8	6.1	6.7
	16*	11.3	18.7	14.4	1.9	3.4	13.6	15.2
5/5-6/77	21	4.7	16.3	9.7	4.1	15.9	8.2	11.2
5/12-13/77	30	4.7	15.5	6.5	1.9	3.4	5.9	7.1
5/19-20/77	8	5.2	15.7	7.4	3.4	10.3	5.1	9.7
5/26-27/77	7	5.1	23.7	9.9	6.9	40.0	4.8	15.0
5/31-6/1/77	1	14.8	14.8	-	-	-	-	-
6/6-7/77	None collected							
6/13-14/77	None collected							
6/20-21/77	None collected							
6/27-28/77	None collected							
7/5-6/77	1	8.5	8.5	-	-	-	-	-
7/11-12/77	None collected							
7/18-19/77	1	3.3	3.3	-	-	-	-	-
7/25-26/77	15	2.6	3.6	3.0	0.2	0.05	3.0	3.0
8/1-2/77	1	3.4	3.4	-	-	-	-	-
8/8-9/77	2	3.4	3.9	3.6	0.35	0.06	1.8	5.4
8/15-16/77	8	3.2	4.2	3.7	0.3	0.1	3.5	3.9
8/22-23/77	8	2.4	3.6	3.2	0.4	0.1	2.9	3.5
8/29-30/77	30	2.8	4.0	3.5	0.4	0.1	3.4	3.6
9/6-7/77	30	3.2	4.9	4.1	0.4	0.1	4.0	4.2
9/12-13/77	4	3.8	12.2	7.7	4.2	13.4	2.8	12.6
9/19-20/77	19	3.2	12.1	5.0	2.4	5.6	4.0	6.0
9/26-27/77	5*	7.9	13.3	10.9	2.0	3.2	9.0	12.8
	30*	3.5	5.4	4.4	0.6	0.3	4.2	4.6
10/3-4/77	2*	10.7	12.9	11.8	1.6	1.2	8.5	15.1
	30*	3.6	5.7	4.6	0.5	0.3	4.4	4.8
10/10-11/77	30	4.1	5.8	4.8	0.4	0.14	4.7	4.9
10/17-18/77	30	3.8	6.3	5.1	0.5	0.3	4.9	5.3
10/24-25/77	30	4.0	6.2	5.1	0.5	0.3	4.8	5.3
10/31-11/1/77	29	4.2	6.0	5.0	0.6	0.3	4.8	5.2
11/10-11/77	2*	12.4	13.8	13.1	1.0	0.5	8.6	17.6
	30*	3.9	6.8	5.4	0.7	0.4	5.2	5.6
12/8-9/77	30	3.8	6.4	5.5	0.6	0.3	5.3	5.7

* Two size classes of fish collected

TABLE D-3

LENGTH OF STATISTICS OF TROUT-PERCH COLLECTED FROM THE
TRAVELING SCREENS OF NO. 1 PUMPHOUSE INTAKE AT USSC GARY WORKS

Date	Sample Size	Length in Centimeters			Standard Deviation	Variance	Confidence Limits	
		Minimum	Maximum	Mean			L ₁	L ₂
1/27-28/77	2	1.9	3.0	2.4	0.8	0.3	-1.2	6.0
2/24-25/77	None collected							
3/17-18/77	3	2.1	10.7	7.6	4.8	15.4	-0.5	15.7
4/6-7/77	1	9.4	9.4	-	-	-	-	-
4/14-15/77	None collected							
4/21-22/77	2	7.6	16.8	12.2	6.5	42.3	27.0	31.0
4/28-29/77	1	10.0	10.0	-	-	-	-	-
5/5-6/77	2	10.1	11.0	10.6	0.6	0.2	0.7	4.7
5/12-13/77	4	5.9	10.7	9.2	2.2	3.6	-1.4	6.6
5/19-20/77	3	4.5	12.7	8.6	4.1	11.2	3.9	9.9
5/26-27/77	30	3.0	11.7	8.0	2.6	6.3	7.2	8.8
5/31-6/1/77	30	6.3	12.5	8.4	1.6	2.6	7.9	8.9
6/6-7/77	30	7.7	12.0	8.9	1.2	1.4	8.5	9.3
6/13-14/77	28	7.2	11.8	9.1	1.2	1.5	8.7	9.5
6/20-21/77	22	6.9	11.6	9.2	1.5	2.0	8.7	9.7
6/27-28/77	30	5.8	12.2	8.4	1.5	2.2	7.9	8.9
7/5-6/77	30	6.4	10.4	8.4	1.1	1.2	8.1	8.7
7/11-12/77	30	4.6	11.8	8.4	1.7	2.9	7.9	8.9
7/18-19/77	30	3.5	9.7	6.9	1.6	2.3	6.4	7.4
7/25-26/77	30	4.9	9.9	7.2	1.5	2.2	6.7	7.7
8/1-2/77	27	4.3	10.5	6.3	1.3	1.6	5.9	6.7
8/8-9/77	24	4.7	10.1	6.7	1.3	1.6	6.2	7.2
8/15-16/77	10	5.0	9.6	7.4	1.5	2.0	6.5	8.3
8/22-23/77	30	4.6	9.3	6.2	1.3	1.6	5.8	6.6
8/29-30/77	30	5.4	9.8	7.1	1.1	1.2	6.8	7.4
9/6-7/77	24	4.5	10.2	7.4	1.5	2.1	6.9	7.9
9/12-13/77	25	5.9	10.0	7.9	1.3	1.6	7.5	8.3
9/19-20/77	30	5.5	8.9	7.2	1.2	1.4	6.8	7.6
9/26-27/77	30	6.0	9.7	7.0	0.8	0.7	6.8	7.2
10/3-4/77	22	6.1	11.3	7.7	1.3	1.6	7.2	8.2
10/10-11/77	9	4.5	11.2	7.5	2.1	3.8	6.2	8.8
10/17-18/77	18	4.7	8.8	6.7	1.9	3.6	5.9	7.5
10/24-25/77	2	7.4	8.0	0.4	0.1	7.7	-0.1	0.8
10/31-11/1/77	2	8.6	10.1	9.3	1.1	0.6	4.4	14.2
11/10-11/77	17	6.5	11.4	8.9	1.5	2.2	8.3	9.5
12/8-9/77	7	2.1	9.7	5.7	2.7	6.2	3.7	7.7

TABLE D-4

LENGTH STATISTICS OF SPOTTAIL SHINER COLLECTED FROM THE
TRAVELING SCREENS OF NO. 1 PUMPHOUSE INTAKE AT USSC GARY WORKS

Date	Sample Size	Length in Centimeters			Standard Deviation	Variance	Confidence Limits	
		Minimum	Maximum	Mean			L ₁	L ₂
1/27-28/77	4	2.8	4.5	4.1	1.0	0.8	2.9	5.3
2/24-25/77	13	4.6	10.4	8.8	1.5	2.1	8.1	9.5
3/17-18/77	5*	7.7	8.5	8.0	0.4	0.1	7.6	8.4
	30*	2.8	5.7	4.5	0.5	0.3	4.3	4.7
4/6-7/77	2	5.0	8.7	6.8	2.6	3.4	4.8	18.4
4/14-15/77	12	4.7	9.9	8.4	1.3	1.7	7.7	9.1
4/21-22/77	49	4.1	10.7	7.0	1.9	3.7	6.5	7.5
4/28-29/77	30*	7.6	11.5	9.1	0.9	0.8	8.8	9.4
	5*	4.5	5.3	4.9	0.3	0.1	4.6	5.2
5/5-6/77	20	3.6	10.1	8.3	1.3	1.6	7.8	8.8
5/12-13/77	30*	7.9	10.7	9.2	0.8	0.7	9.0	9.4
	6*	4.0	4.7	4.3	0.3	0.05	4.1	4.5
5/19-20/77	30*	7.5	10.9	8.8	0.8	0.7	8.6	9.0
	3*	4.4	5.5	4.8	0.6	0.2	3.8	5.8
5/26-27/77	30*	7.5	11.0	8.6	0.8	0.7	8.4	8.8
	2*	5.0	5.5	5.2	0.3	0.1	4.6	5.8
5/31-6/1/77	29*	6.1	11.2	9.0	1.1	1.2	8.7	9.3
	17*	3.8	5.3	4.6	0.4	0.2	4.4	4.8
6/6-7/77	30	7.7	11.4	9.0	1.1	1.2	8.7	9.3
6/13-14/77	30*	8.0	11.7	9.0	1.0	1.0	8.7	9.3
	2*	4.6	5.5	5.0	0.6	0.2	3.8	6.2
6/20-21/77	17	10.5	7.6	9.0	0.7	0.5	8.7	9.3
6/27-28/77	27	4.7	11.0	8.7	1.2	1.4	8.3	9.1
7/5-6/77	13	6.2	10.3	8.9	1.2	1.3	8.3	9.5
7/11-12/77	29	5.2	12.1	8.7	1.2	1.3	8.3	9.1
7/18-19/77	18	4.4	9.9	7.5	2.0	3.9	6.7	8.3
7/25-26/77	9	8.6	10.5	9.3	0.6	0.3	8.9	9.7
8/1-2/77	5	8.3	10.6	9.4	1.0	0.8	8.4	10.4
8/8-9/77	10	3.5	9.4	5.2	2.1	4.1	4.0	6.4
8/15-16/77	5	6.3	9.7	7.6	1.4	1.6	6.7	8.5
8/22-23/77	15	5.7	11.0	8.0	2.0	3.7	7.1	8.9
8/29-30/77	27	4.8	10.8	8.0	1.4	1.9	7.5	8.5
9/6-7/77	11	5.8	10.4	8.0	1.5	2.2	7.1	8.8
9/12-13/77	8	6.0	9.1	7.7	1.2	1.2	6.9	8.5
9/19-20/77	14	4.6	9.9	7.4	1.8	3.2	6.5	8.3
9/26-27/77	19*	6.3	11.0	8.6	1.2	1.4	8.1	9.1
	30*	4.5	6.7	5.5	0.6	0.3	5.3	5.7
10/3-4/77	21*	7.1	10.5	8.7	1.1	1.1	8.3	9.1
	20*	4.2	5.7	5.1	0.6	0.4	4.7	5.3
10/10-11/77	28	4.4	9.8	6.1	1.4	2.0	5.6	6.6
10/17-18/77	22	3.6	9.8	5.7	2.0	3.7	5.0	6.4
10/24-25/77	4	4.0	9.8	6.1	2.5	4.8	3.1	9.0
10/31-11/1/77	2	4.8	5.2	5.0	0.3	0.04	3.7	6.3
11/10-11/77	30*	7.2	10.3	8.7	0.9	0.7	8.4	9.0
	30*	6.7	3.8	4.9	0.7	0.5	4.7	5.1
12/8-9/77	13	2.9	7.7	4.8	1.3	1.6	4.1	5.4

* Two size classes of fish collected

TABLE D-5

LENGTH STATISTICS OF YELLOW PERCH COLLECTED FROM THE TRAVELING
SCREENS OF NO. 1 PUMPHOUSE INTAKE AT USSC GARY WORKS

Date	Sample Size	Length in Centimeters			Standard Deviation	Variance	Confidence Limits	
		Minimum	Maximum	Mean			L ₁	L ₂
1/27-28/77	None collected							
2/24-25/77	None collected							
3/17-18/77	None collected							
4/6-7/77	None collected							
4/14-15/77	None collected							
4/21-22/77	2	7.6	16.8	12.2	6.5	42.3	-16.8	41.2
4/28-29/77	3	13.5	14.2	13.8	0.4	0.1	13.1	14.5
5/5-6/77	None collected							
5/12-13/77	None collected							
5/19-20/77	1	7.0	7.0	-	-	-	-	-
5/26-27/77	1	9.8	9.8	-	-	-	-	-
5/31-6/1/77	4	7.3	7.9	7.7	0.3	0.1	7.3	8.1
6/6-7/77	7	7.3	16.3	9.5	3.0	9.2	7.3	11.7
6/13-14/77	1	17.1	17.1	-	-	-	-	-
6/20-21/77	4	8.2	22.1	12.5	6.5	41.6	4.9	20.1
6/27-28/77	18	7.9	22.2	11.2	4.2	18.0	9.5	12.9
7/5-6/77	10	7.5	21.7	11.7	5.0	24.6	8.8	14.6
7/11-12/77	28	7.2	13.6	9.6	1.5	2.2	9.1	10.1
7/18-19/77	25	7.7	18.7	11.2	3.6	13.2	10.0	12.4
7/25-26/77	15	3.8	19.7	10.7	5.9	34.9	8.0	13.4
8/1-2/77	22	3.6	19.0	7.7	5.2	27.1	5.8	9.6
8/8-19/77	30	4.4	5.2	4.7	0.2	0.1	4.6	4.8
8/15-16/77	30	4.5	18.7	9.5	4.6	20.8	8.1	10.9
8/22-23/77	30	8.3	20.5	12.2	2.6	6.8	11.4	13.0
8/29-30/77	36	3.8	6.3	5.5	0.5	0.3	5.4	5.6
9/6-7/77	25	2.8	18.6	7.0	3.5	12.1	5.8	8.2
9/12-13/77	20	5.2	26.5	10.1	6.4	41.4	7.6	12.6
9/19-20/77	26	5.0	19.4	8.0	3.4	11.8	6.9	9.1
9/26-27/77	22	9.9	16.4	13.0	1.6	2.7	12.4	13.6
10/3-4/77	30	4.8	8.3	6.8	1.0	1.1	6.5	7.1
10/10-11/77	6	4.7	7.3	5.9	1.0	0.9	5.1	6.7
10/17-18/77	22	4.6	14.5	6.4	2.0	3.9	5.7	8.3
10/24-25/77	13	5.1	15.1	7.6	3.3	10.9	6.0	9.2
10/31-11/1/77	3	5.2	7.2	6.2	1.0	0.7	4.5	7.9
11/10-11/77	30	4.7	14.6	6.7	2.0	4.1	6.1	7.3
12/8-9/77	9	4.0	17.2	7.7	4.2	15.9	5.1	10.3

TABLE D-6

WEIGHT STATISTICS OF ALEWIVES COLLECTED FROM THE TRAVELING
SCREENS OF NO. 1 PUMPHOUSE INTAKE AT USSC GARY WORKS

Date	Sample Size	Weight in Grams			Standard Deviation	Variance	Confidence Limits	
		Minimum	Maximum	Mean			L ₁	L ₂
1/27-28/77	None collected							
2/24-25/77	None collected							
3/17-18/77	8	37.9	67.7	51.0	12.6	139.5	42.6	59.4
4/6-7/77	30	31.0	57.2	42.1	6.4	39.7	40.1	44.1
4/14-15/77	30*	32.1	64.0	42.3	8.2	65.5	39.8	44.8
4/21-22/77	22*	3.7	14.1	9.5	2.5	6.0	8.6	10.4
4/28-29/77	30*	33.5	59.9	41.7	6.6	47.0	39.7	43.7
	30*	4.5	15.3	9.0	3.0	8.6	8.1	9.9
	30*	32.2	57.4	42.8	7.0	47.7	40.6	45.0
	30*	5.0	17.8	9.3	2.7	7.2	8.5	10.1
5/5-6/77	30*	16.1	50.8	36.1	7.9	60.1	33.6	38.6
	30*	3.1	15.2	7.8	3.5	11.7	6.7	8.9
5/12-13/77	30*	59.7	20.6	33.7	8.6	71.2	31.0	36.4
	30*	3.8	12.0	7.6	2.2	4.9	6.9	8.3
5/19-20/77	30*	22.8	43.6	33.4	6.0	34.6	31.5	35.3
	27*	3.4	10.9	7.1	2.2	4.8	6.4	7.8
5/26-27/77	30*	14.4	50.1	28.7	8.7	72.4	26.0	31.4
	30*	3.8	15.2	8.3	3.3	10.5	7.3	9.3
5/31-6/1/77	30*	22.7	57.5	32.9	9.1	81.0	30.1	35.7
	27*	3.6	12.9	8.0	2.7	7.0	7.1	8.9
6/6-7/77	30*	19.6	45.5	30.8	6.7	43.5	28.7	32.9
	27*	2.5	13.4	7.3	2.8	7.7	6.4	8.2
6/13-14/77	30*	11.0	40.4	25.4	7.9	61.0	22.9	27.9
	30*	3.6	11.2	6.7	2.1	4.1	6.0	7.4
6/20-21/77	30*	16.4	48.8	30.3	7.8	58.8	27.9	32.7
	24*	3.8	12.0	8.0	2.0	3.7	7.3	8.7
6/27-28/77	30*	13.4	46.4	25.0	6.4	39.1	23.0	27.0
	10*	6.6	14.7	10.2	2.4	5.0	8.8	11.6
7/5-6/77	30*	15.0	42.9	27.5	7.8	59.2	25.1	29.9
	5*	5.0	12.5	8.9	2.8	6.34	6.2	11.6
7/11-12/77	30*	17.4	42.4	26.6	6.5	40.6	24.6	28.6
	2*	6.8	9.2	8.0	1.7	1.4	0.4	15.6
7/18-19/77	30*	14.7	39.4	25.2	5.3	27.4	23.6	26.8
	3*	5.9	8.5	6.9	1.4	1.3	4.5	9.3
7/25-26/77	30*	16.3	44.8	25.6	7.3	52.3	23.3	27.9
	11*	0.1	0.6	0.2	0.2	0.03	0.1	0.3
8/1-2/77	30*	14.9	44.0	24.6	6.5	40.6	22.6	26.6
	2*	0.3	0.6	0.4	0.2	0.02	-0.5	1.3
8/8-9/77	30*	15.0	27.9	24.0	5.8	32.7	22.2	25.8
	8*	0.5	1.9	1.2	0.4	0.2	0.9	1.5
8/15-16/77	28	2.5	31.7	23.6	7.3	50.9	21.3	25.9
8/22-23/77	30	17.2	39.9	27.6	7.1	48.7	25.4	29.8
8/29-30/77	30*	14.4	52.8	29.3	9.8	92.3	26.3	32.3
	30*	0.2	2.9	0.84	0.55	0.29	0.6	1.0
9/6-7/77	30*	17.1	48.1	27.8	6.7	42.8	25.7	29.9
	30*	0.2	3.7	1.1	1.0	0.9	0.8	1.4
9/12-13/77	23*	18.1	38.6	25.9	5.5	29.4	23.9	27.9
	12*	0.2	15.8	2.9	4.3	17.5	0.7	5.1
9/19-20/77	30*	19.0	42.6	28.7	5.9	34.0	26.9	30.5
	30*	0.1	2.6	1.5	0.56	0.31	1.3	1.7
9/26-27/77	30*	18.5	50.4	31.2	8.4	67.7	28.6	33.8
	30*	0.5	1.6	1.0	0.3	0.1	0.9	1.1
10/3-4/77	30*	18.5	46.2	29.8	6.6	41.5	27.8	31.8
	30*	0.2	5.0	1.5	1.1	1.2	1.2	1.8
10/10-11/77	6*	11.8	51.4	36.6	13.2	145.5	25.7	47.5
	30*	0.3	2.7	1.2	0.7	0.5	1.0	1.4
10/17-18/77	9*	23.2	56.9	33.8	9.1	74.5	28.2	39.4
	30*	0.2	5.2	1.7	1.2	1.5	1.3	2.1
10/24-25/77	3*	44.4	56.9	51.0	6.3	26.3	40.4	61.6
	30*	0.7	4.8	1.7	1.0	1.0	1.4	2.0
10/31-11/1/77	27	0.2	44.0	2.9	8.2	65.6	0.2	5.6
11/10-11/77	30*	21.3	67.0	39.8	10.8	113.5	36.4	43.2
	30*	0.4	5.0	1.9	1.3	1.7	1.5	2.3
12/8-9/77	30*	43.6	23.9	34.0	4.8	22.0	32.5	35.5
	30*	0.7	8.3	4.1	2.0	3.9	3.5	4.7

* Two size classes of fish collected

TABLE D-9

WEIGHT STATISTICS OF SPOTTAIL SHINER COLLECTED
FROM THE TRAVELING SCREENS OF NO. 1 PUMPHOUSE INTAKE AT USSC GARY WORKS

Date	Sample Size	Weight in Grams			Standard Deviation	Variance	Confidence Limits	
		Minimum	Maximum	Mean			L ₁	L ₂
1/27-28/77	4	0.5	2.4	1.4	0.8	0.5	0.5	2.3
2/24/-25/77	16	1.7	21.1	13.4	5.2	25.6	11.1	15.7
3/17-18/77	5*	6.3	10.6	8.0	1.8	2.5	6.3	9.7
	30*	0.4	2.9	1.5	0.5	0.2	-1.3	1.7
4/6-7/77	3	2.1	16.8	10.4	7.5	37.8	-2.2	23.0
4/14-15/77	13	1.5	17.8	11.2	4.0	15.0	9.2	13.2
4/21-22/77	49	0.7	21.8	7.9	5.5	30.0	6.6	9.2
4/28-29/77	30*	6.9	25.3	13.8	4.3	17.7	12.5	15.1
	5*	1.5	2.4	2.0	0.3	0.1	1.7	2.3
5/5-6/77	20	0.7	17.9	10.3	3.6	12.7	8.9	11.7
5/12-13/77	30	7.9	23.8	13.8	4.3	18.3	12.5	15.1
5/19-20/77	30*	7.7	22.5	11.9	3.6	12.9	10.8	13.0
	2*	1.6	2.8	4.4	2.3	2.7	-5.9	14.7
5/26-27/77	30	6.2	23.5	10.5	3.6	12.4	9.4	11.6
	2	1.9	2.2	2.0	0.2	0.02	1.1	2.9
5/31-6/1/77	30*	3.9	26.5	12.6	5.3	27.6	11.0	14.2
	14*	1.0	2.6	1.7	0.4	0.2	1.5	1.9
6/6-7/77	30	4.4	22.4	12.2	3.9	14.4	11.0	13.4
6/13-14/77	29	7.2	19.3	11.0	3.3	10.6	10.0	12.0
	2	1.7	2.0	1.8	0.2	0.02	0.9	2.7
6/20-21/77	17	6.3	18.2	10.6	3.3	10.5	9.2	12.0
6/27-28/77	27	1.8	17.8	10.6	3.5	11.8	9.5	11.7
7/5-6/77	13	2.9	20.2	11.6	4.8	21.2	9.2	14.0
7/11-12/77	29	2.1	26.7	9.5	4.3	18.1	8.1	10.9
7/18-19/77	18	1.3	13.5	7.4	4.8	21.7	5.4	9.4
7/25-26/77	9	6.3	17.4	10.8	3.3	9.7	8.8	12.8
8/1-2/77	6	2.5	15.6	9.6	4.7	18.1	5.7	13.5
8/8-9/77	10	0.4	12.5	3.2	4.5	17.9	0.6	5.8
8/15-16/77	5	3.0	12.4	6.4	3.8	11.7	2.8	10.0
8/22-23/77	15	1.9	17.9	7.8	5.3	26.5	5.4	10.2
8/29-30/77	27	1.8	17.8	8.7	4.6	20.0	7.2	10.2
9/6-7/77	12	3.1	18.5	8.9	4.9	22.3	6.4	11.4
9/12-13/77	8	2.8	12.5	7.6	3.2	9.1	5.5	9.7
9/19-20/77	15	1.2	14.0	7.3	4.5	19.0	5.3	9.3
9/26-27/66	19*	4.4	18.8	10.7	4.3	17.7	9.0	12.4
	30*	1.5	4.9	2.7	0.9	0.7	2.4	3.0
10/3-4/77	21*	4.3	15.1	10.3	3.7	13.0	8.9	11.7
	20*	0.8	2.9	1.7	0.7	0.5	1.4	2.0
10/10-11/77	28	1.2	16.2	4.2	3.7	13.2	3.0	5.4
10/17-18/77	22	0.8	17.6	4.2	4.7	21.3	2.5	5.9
10/24-25/77	4	1.2	17.0	5.9	7.4	41.6	-2.8	14.6
10/31-11/1/77	2	1.6	1.9	1.7	0.2	0.02	0.8	2.6
11/10-11/77	30*	5.5	20.5	11.9	3.6	12.2	10.8	13.0
	30*	0.7	3.3	1.7	0.8	0.6	1.5	1.9
12/8-9/77	13	0.3	7.8	2.3	1.9	3.4	1.4	3.2

* Two size classes of fish collected

TABLE D-10

WEIGHT STATISTICS OF YELLOW-PERCH COLLECTED FROM THE
TRAVELING SCREENS OF No. 1 PUMPHOUSE INTAKE AT USSC GARY WORKS

Date	Sample Size	Weight in Grams			Standard Deviation	Variance	Confidence Limits	
		Minimum	Maximum	Mean			L ₁	L ₂
1/27-28/77	None collected							
2/24-25/77	None collected							
3/17-18/77	None collected							
4/6-7/77	None collected							
4/14-15/77	None collected							
4/21-22/77	2	7.8	103.1	55.4	67.4	2270.5	-245.5	356.3
4/28-29/77	3	46.4	65.5	56.3	9.6	61.0	40.1	72.5
5/5-6/77	None collected							
5/12-13/77	None collected							
5/19-20/77	1	5.7	5.7	-	-	-	-	-
5/26-27/77	1	8.0	8.0	-	-	-	-	-
5/31-6/1/77	4	5.5	10.0	8.3	2.0	3.0	5.9	10.7
6/6-7/77	7	6.1	75.6	19.6	24.8	526.9	1.4	37.8
6/13-14/77	1	132.1	132.1	-	-	-	-	-
6/20-21/77	4	9.0	188.4	58.0	87.0	5683.3	-44.4	160.4
6/27-28/77	18	9.6	223.2	39.9	57.3	3103.5	16.4	66.4
7/5-6/77	10	8.2	190.5	46.4	59.9	3231.3	11.7	81.1
7/11-12/77	28	6.6	31.8	16.4	8.5	70.0	13.7	19.1
7/18-19/77	25	3.3	128.4	33.2	36.7	1292.8	20.6	45.8
7/25-26/77	15	0.3	155.1	41.2	49.9	2326.3	18.5	63.9
8/1-2/77	22	0.7	123.9	22.4	39.3	1476.4	8.0	36.8
8/8-9/77	11*	10.3	216.9	44.5	61.1	3389.7	11.1	77.9
	30*	1.3	2.6	1.8	0.3	0.8	1.7	1.9
8/15-16/77	30	0.9	110.6	26.3	29.9	862.5	17.0	35.6
8/22-23/77	30*	13.3	160.6	37.4	29.7	854.3	28.2	46.6
	30*	0.7	3.4	1.9	0.7	0.5	1.7	2.1
8/29-30/77	6*	17.3	70.5	34.0	20.1	335.8	17.5	50.5
	30*	1.1	4.3	2.9	0.7	0.5	2.7	3.1
9/6-7/77	26	0.4	116.7	11.7	24.2	562.1	3.6	19.8
9/12-13/77	21	2.4	393.2	46.8	96.1	8795.1	10.6	83.0
9/19-20/77	26	2.8	160.6	17.0	32.8	1033.8	6.0	28.0
9/26-27/77	22*	23.4	67.7	47.1	15.1	218.3	41.6	52.6
	30*	2.3	6.5	3.8	1.2	1.3	3.4	4.2
10/3-4/77	4*	36.9	46.3	41.3	5.1	19.5	35.3	47.3
	30*	1.4	10.5	5.5	2.5	6.1	4.7	6.3
10/10-11/77	6	1.5	6.3	3.6	1.8	2.8	2.1	5.1
10/17-18/77	22	1.7	56.7	6.2	11.4	124.0	2.0	10.4
10/24-25/77	13	2.7	60.5	12.4	19.2	340.3	2.9	21.9
10/31-11/1/77	3	2.3	6.8	4.3	2.3	3.5	0.4	8.2
11/10-11/77	30	1.9	63.0	7.5	12.2	143.9	3.7	11.3
12/8-9/77	9	1.3	86.4	18.4	29.4	770.5	0.2	36.6

* Two size classes of fish collected

APPENDIX E

SUMMARY OF FISH EGGS AND LARVAE COLLECTED FROM
USSC GARY WORKS LAKESIDE PUMPHOUSE INTAKE

TABLE E-1
SUMMARY OF FISH EGGS AND LARVA COLLECTED DURING EACH SAMPLING PERIOD
AT USSC GARY WORKS LAKESIDE PUMPHOUSE INTAKE FROM
APRIL 6, 1977 THROUGH NOVEMBER 1, 1977

Collection Date	Collection Level	Hours of Collection	Collection Time (Hours)	Actual Volume of Water Pumped (Cubic Meters)	Number of Fish Eggs	Total Number of Fish Larvae	Description of Larvae Collected
April 6, 1977	Surface	1030 to 1830	8.0	164.62	None	None	
April 6, 1977	Bottom	1030 to 1830	8.0	143.91	None	None	
April 6-7, 1977	Surface	1845 to 0245	8.0	164.62	None	None	
April 6-7, 1977	Bottom	1845 to 0245	8.0	143.91	None	None	
April 7, 1977	Surface	0300 to 1030	7.5	154.33	None	None	
April 7, 1977	Bottom	0300 to 1030	7.5	134.91	None	None	
April 14, 1977	Surface	1000 to 1800	8.0	164.62	None	None	
April 14, 1977	Bottom	1000 to 1800	8.0	143.91	None	None	
April 14-15, 1977	Surface	1815 to 0200	7.75	159.48	None	None	
April 14-15, 1977	Bottom	1815 to 0200	7.75	139.41	None	None	
April 15, 1977	Surface	0215 to 1000	7.75	159.48	None	None	
April 15, 1977	Bottom	0215 to 1000	7.75	139.41	None	None	
April 21, 1977	Surface	1000 to 1800	8.0	164.62	None	None	
April 21, 1977	Bottom	1000 to 1800	8.0	143.91	None	None	
April 21-22, 1977	Surface	1815 to 0200	7.75	159.48	None	None	
April 21-22, 1977	Bottom	1815 to 0200	7.75	139.41	None	None	
April 22, 1977	Surface	0215 to 1000	7.75	159.48	None	None	
April 22, 1977	Bottom	0215 to 1000	7.75	139.41	None	None	
April 28, 1977	Surface	1000 to 1800	8.0	171.89	None	None	
April 28, 1977	Bottom	1000 to 1800	8.0	171.89	None	1	1 Rainbow smelt (prolarva)
April 28-29, 1977	Surface	1810 to 0200	7.83	168.31	None	None	
April 28-29, 1977	Bottom	1810 to 0200	7.83	146.78	None	None	
April 29, 1977	Surface	0215 to 1000	7.75	166.52	None	None	
April 29, 1977	Bottom	0215 to 1000	7.75	145.22	None	None	
May 5, 1977	Surface	0950 to 1750	8.0	168.25	None	None	
May 5, 1977	Bottom	0950 to 1750	8.0	149.90	None	None	
May 5-6, 1977	Surface	1800 to 0150	7.83	161.37	None	None	
May 5-6, 1977	Bottom	1800 to 0150	7.83	146.25	None	None	
May 6, 1977	Surface	0200 to 0950	7.83	164.80	None	None	
May 6, 1977	Bottom	0200 to 0950	7.83	149.39	None	None	
May 12, 1977	Surface	1000 to 1800	8.0	168.25	None	None	
May 12, 1977	Bottom	1000 to 1800	8.0	149.90	None	None	
May 12-13, 1977	Surface	1810 to 0210	8.0	164.80	None	None	
May 12-13, 1977	Bottom	1810 to 0210	8.0	148.94	1	None	
May 13, 1977	Surface	0220 to 1000	7.67	157.93	2	None	
May 13, 1977	Bottom	0220 to 1000	7.67	143.13	None	None	
May 19, 1977	Surface	0945 to 1750	8.08	170.10	None	None	
May 19, 1977	Bottom	0945 to 1750	8.08	151.46	None	None	
May 19-20, 1977	Surface	1800 to 0200	8.0	164.80	None	None	
May 19-20, 1977	Bottom	1800 to 0200	8.0	149.36	None	None	
May 20, 1977	Surface	0210 to 0945	7.58	156.22	None	None	
May 20, 1977	Bottom	0210 to 0945	7.58	141.58	None	None	
May 26, 1977	Surface	1000 to 1800	8.0	168.34	None	None	
May 26, 1977	Bottom	1000 to 1800	8.0	149.90	None	None	
May 26-27, 1977	Surface	1810 to 0205	7.92	166.59	None	None	
May 26-27, 1977	Bottom	1810 to 0205	7.92	148.34	None	None	
May 27, 1977	Surface	0215 to 1000	7.75	163.08	112	None	
May 27, 1977	Bottom	0215 to 1000	7.75	145.22	None	None	
May 31, 1977	Surface	0930 to 1740	8.17	168.23	9	None	
May 31, 1977	Bottom	0930 to 1740	8.17	152.47	None	None	
May 31-June 1, 1977	Surface	1800 to 0200	8.0	164.80	240*	None	
May 31-June 1, 1977	Bottom	1800 to 0200	8.0	149.36	120*	2	1 Minnow (prolarva) 1 Unidentifiable (prolarva, damaged) 1 Smallmouth bass (prolarva)
June 1, 1977	Surface	0210 to 0930	7.33	151.07	300*	1	
June 1, 1977	Bottom	0210 to 0930	7.33	136.91	150*	None	

TABLE E-1
(Continued)

Collection Date	Collection Level	Hours of Collection	Collection Time (Hours)	Actual Volume of Water Pumped (Cubic Meters)	Number of Fish Eggs	Total Number of Fish Larvae	Description of Larvae Collected
June 6, 1977	Surface	0930 to 1730	8.0	168.07	220*	5	5 Minnow (prolarva, 2 damaged)
June 6, 1977	Bottom	0930 to 1730	8.0	149.90	275*	11	6 Minnow (prolarva) 5 Unidentifiable (prolarva, damaged)
June 6-7, 1977	Surface	1740 to 1325	7.92	163.52	None	8	1 Trout-perch (prolarva) 7 Yellow perch ? (prolarva)
June 6-7, 1977	Bottom	1740 to 1325	7.92	145.22	None	7	2 Minnow (prolarva) 5 Unidentifiable (prolarva, damaged)
June 7, 1977	Surface	1340 to 0930	8.17	165.28	130*	5	4 Minnow (prolarva) 1 Unidentifiable (damaged)
June 7, 1977	Bottom	1340 to 0930	8.17	146.78	34*	5	1 Alewife (prolarva) 4 Minnow (prolarva)
June 13, 1977	Surface	1000 to 1800	8.0	168.80	80*	1	1 Minnow (prolarva)
June 13, 1977	Bottom	1000 to 1800	8.0	149.90	21	1	1 Minnow (prolarva)
June 13-14, 1977	Surface	1815 to 0200	7.75	163.52	140*	1	1 Unidentifiable (prolarva, damaged) Fragments of 2 larva
June 13-14, 1977	Bottom	1815 to 0200	7.75	145.22	120*	9	1 Alewife ? (prolarva, gut damaged) 1 Minnow (prolarva) 4 Yellow perch (prolarva) 2 Unidentifiable (prolarva, fragment)
June 14, 1977	Surface	0210 to 1000	7.83	165.28	150*	None	
June 14, 1977	Bottom	0210 to 1000	7.83	146.78	250*	1	1 Yellow perch (prolarva) 2 Fragments of larvae
June 20, 1977	Surface	0920 to 1730	8.17	166.38	70*	None	
June 20, 1977	Bottom	0920 to 1730	8.17	150.43	12	3	1 Alewife (prolarva) 2 Yellow perch (prolarva)
June 20-21, 1977	Surface	1740 to 0130	2.83	159.59	320*	1	1 Unidentifiable (prolarva, damaged)
June 20-21, 1977	Bottom	1740 to 0130	2.83	144.29	45*	1	1 Minnow (prolarva)
June 21, 1977	Surface	0145 to 0930	7.75	157.89	110*	None	
June 21, 1977	Bottom	0145 to 0930	7.75	142.75	360*	1	1 Minnow (prolarva)
June 27, 1977	Surface	1000 to 1750	2.83	165.28	80*	None	
June 27, 1977	Bottom	1000 to 1750	2.83	146.78	160*	None	
June 27-28, 1977	Surface	1810 to 0200	7.83	165.28	95*	2	1 Minnow (prolarva) 1 Unidentifiable (prolarva, damaged)
June 27-28, 1977	Bottom	1810 to 0200	7.83	146.78	210*	2	1 Trout-perch (prolarva) 1 Yellow perch (prolarva)
June 28, 1977	Surface	0210 to 0930	7.33	154.73	300*	None	
June 28, 1977	Bottom	0210 to 0930	7.33	137.41	450*	None	
July 5, 1977	Surface	1000 to 1800	8.0	162.98	60*	None	
July 5, 1977	Bottom	1000 to 1800	8.0	147.36	30*	None	
July 5-6, 1977	Surface	1810 to 0200	7.83	159.59	280*	None	
July 5-6, 1977	Bottom	1810 to 0200	7.83	144.29	180*	2	1 Yellow perch ? (prolarva) 2 Unidentifiable (prolarva, damaged)
July 6, 1977	Surface	0215 to 1000	7.75	157.89	905*	2	1 Unidentifiable (damaged) 1 Unidentifiable (decomposed)
July 6, 1977	Bottom	0215 to 1000	7.75	142.75	800*	None	

TABLE E-1
(Continued)

Collection Date	Collection Level	Hours of Collection	Collection Time (Hours)	Actual Volume of Water Pumped (Cubic Meters)	Number of Fish Eggs	Total Number of Fish Larvae	Description of Larvae Collected
July 10, 1977	Surface	0930 to 1730	8.0	158.90	107	None	
July 10, 1977	Bottom	0930 to 1730	8.0	145.00	45	1	1 Herring (postlarva, damaged gut)
July 10-11, 1977	Surface	1745 to 0130	7.75	153.93	760*	1	1 Trout-perch (prolarva)
July 10-11, 1977	Bottom	1745 to 0130	7.75	140.46	260*	None	
July 11, 1977	Surface	0140 to 0930	7.83	155.58	1250*	1	1 Smelt (postlarva or juvenile, damaged)
July 11, 1977	Bottom	0140 to 0930	7.83	141.98	1100*	None	
July 18, 1977	Surface	0930 to 1730	8.0	158.90	232*	None	
July 18, 1977	Bottom	0930 to 1730	8.0	145.00	320*	None	
July 18-19, 1977	Surface	1740 to 0125	7.75	153.93	150*	None	
July 18-19, 1977	Bottom	1740 to 0125	7.75	140.46	100*	None	
July 19, 1977	Surface	0140 to 0930	7.83	155.58	680*	None	
July 19, 1977	Bottom	0140 to 0930	7.83	141.98	480*	None	
July 25, 1977	Surface	0915 to 1720	8.08	160.55	360*	1	1 Smelt (late prolarva)
July 25, 1977	Bottom	0915 to 1720	8.08	146.51	320*	None	
July 25-26, 1977	Surface	1730 to 0115	7.75	176.64	440*	6	2 Smelt (postlarva, damaged)
July 25-26, 1977	Bottom	1730 to 0115	7.75	140.46	810*	2	4 Alewife (prolarva, damaged)
July 26, 1977	Surface	0125 to 0915	7.83	155.58	376*	12	2 Herring (prolarva, damaged)
July 26, 1977	Bottom	0125 to 0915	7.83	141.98	560*	5	11 Alewife (postlarva, 6 damaged)
August 1, 1977	Surface	0925 to 1725	8.0	158.90	9	1	1 Smelt (late postlarva, damaged)
August 1, 1977	Bottom	0925 to 1725	8.0	145.00	8	None	1 Alewife (early prolarva)
August 1-2, 1977	Surface	1740 to 0120	7.67	152.28	7	2	4 Alewife (prolarva, damaged)
August 1-2, 1977	Bottom	1740 to 0120	7.67	138.95	None	1	1 Unidentified fragment
August 2, 1977	Surface	0130 to 0915	7.75	153.93	256*	2	2 Alewife (postlarva, 1 damaged)
August 2, 1977	Bottom	0130 to 0915	7.75	140.46	144*	2	1 Alewife (postlarva)
August 8, 1977	Surface	0930 to 1745	8.25	163.77	None	None	2 Alewife ? (postlarva, damaged)
August 8, 1977	Bottom	0930 to 1745	8.25	146.71	None	None	2 Alewife ? (postlarva, damaged)
August 8-9, 1977	Surface	1800 to 0130	7.50	148.88	7	None	2 Alewife ? (postlarva, damaged)
August 8-9, 1977	Bottom	1800 to 0130	7.5	133.88	None	1	2 damaged larvae, possibly Alewife
August 9, 1977	Surface	0140 to 0930	7.83	155.58	56	5	1 Trout-perch (prolarva)
August 9, 1977	Bottom	0140 to 0930	7.83	141.98	24	4	1 Alewife ? (damaged)
August 15, 1977	Surface	0930 to 1730	8.0	163.17	None	2	2 Rainbow smelt (late postlarva)
August 15, 1977	Bottom	0930 to 1730	8.0	141.18	None	None	2 Trout-perch (prolarva)
August 15-16, 1977	Surface	1735 to 0130	7.92	161.47	None	1	2 Alewife ? (prolarva, damaged)
August 15-16, 1977	Bottom	1735 to 0130	7.92	139.71	None	None	1 Alewife ? (prolarva, damaged)
August 16, 1977	Surface	0140 to 0930	7.83	159.71	7	1	1 Alewife ? (prolarva, damaged)
August 16, 1977	Bottom	0140 to 0930	7.83	138.24	1	None	1 Rainbow smelt (juvenile)

TABLE E-1
(Continued)

Collection Date	Collection Level	Hours of Collection	Collection Time (Hours)	Actual Volume of Water Pumped (Cubic Meters)	Number of Fish Eggs	Total Number of Fish Larvae	Description of Larvae Collected
August 22, 1977	Surface	0920 to 1720	8.0	163.17	None	1	1 Rainbow smelt (juvenile)
August 22, 1977	Bottom	0920 to 1720	8.0	141.18	None	None	
August 22-23, 1977	Surface	1735 to 0120	7.75	158.07	None	1	1 Alewife ? (prolarva)
August 22-23, 1977	Bottom	1735 to 0120	7.75	136.77	None	None	
August 23, 1977	Surface	0130 to 0920	7.83	158.07	27	2	1 Rainbow smelt (juvenile) 1 Unidentifiable (prolarva fragment)
August 23, 1977	Bottom	0130 to 0920	2.83	136.77	21	None	
August 29, 1977	Surface	0930 to 1735	8.08	164.87	None	1	1 Rainbow smelt (juvenile)
August 29, 1977	Bottom	0930 to 1735	8.08	142.65	None	None	
August 29-30, 1977	Surface	1740 to 0120	7.67	156.37	None	None	
August 29-30, 1977	Bottom	1740 to 0120	7.67	135.30	None	None	
August 30, 1977	Surface	0130 to 0925	7.83	161.47	None	None	
August 30, 1977	Bottom	0130 to 0925	7.83	139.71	None	None	
September 6, 1977	Surface	0930 to 1725	7.92	168.84	None	3	3 Alewife (postlarva)
September 6, 1977	Bottom	0930 to 1725	7.92	142.77	None	None	
September 6-7, 1977	Surface	1745 to 0130	7.75	165.28	None	2	2 Alewife (postlarva, damaged)
September 6-7, 1977	Bottom	1745 to 0130	7.75	137.76	None	None	
September 7, 1977	Surface	0135 to 0930	7.92	168.84	None	None	
September 7, 1977	Bottom	0135 to 0930	7.92	142.77	None	None	
September 12, 1977	Surface	0930 to 1745	8.25	175.95	None	None	
September 12, 1977	Bottom	0930 to 1745	8.25	148.78	None	None	
September 12-13, 1977	Surface	1755 to 0125	7.50	159.95	None	None	
September 12-13, 1977	Bottom	1755 to 0125	7.50	135.25	None	None	
September 13, 1977	Surface	0135 to 0930	8.08	168.84	None	None	
September 13, 1977	Bottom	0135 to 0930	8.08	142.77	None	None	
September 19, 1977	Surface	0930 to 1730	8.0	170.62	None	None	
September 19, 1977	Bottom	0930 to 1730	8.0	144.27	None	None	
September 19-20, 1977	Surface	1740 to		172.35	2	None	
September 19-20, 1977	Bottom	1740 to		145.77	None	None	
September 20, 1977	Surface	0140 to 0930	7.83	163.51	None	2	2 Alewife (postlarva, damaged)
September 20, 1977	Bottom	0140 to 0930	7.83	138.26	None	None	
September 26, 1977	Surface	0930 to 1730	8.0	170.62	None	None	
September 26, 1977	Bottom	0930 to 1730	8.0	144.50	None	None	
September 26-27, 1977	Surface	1745 to 0130	7.75	165.29	None	None	
September 26-27, 1977	Bottom	1745 to 0130	7.75	139.76	None	None	
September 27, 1977	Surface	0135 to 0930	7.92	168.84	None	None	
September 27, 1977	Bottom	0135 to 0930	7.92	142.77	None	None	
October 3, 1977	Surface	0930 to 1735	8.08	172.39	None	None	
October 3, 1977	Bottom	0930 to 1735	8.08	145.77	None	None	
October 3-4, 1977	Surface	1740 to 0140	8.0	170.62	None	None	
October 3-4, 1977	Bottom	1740 to 0140	8.0	144.27	None	None	
October 4, 1977	Surface	0145 to 0930	7.75	168.84	None	None	
October 4, 1977	Bottom	0145 to 0930	7.75	142.77	None	None	
October 10, 1977	Surface	0930 to 1730	8.0	170.62	None	None	
October 10, 1977	Bottom	0930 to 1730	8.0	144.27	None	None	
October 10-11, 1977	Surface	1745 to 0130	7.75	165.29	None	1	1 Unidentified Larva (damaged)
October 10-11, 1977	Bottom	1745 to 0130	7.75	139.76	None	None	
October 11, 1977	Surface	0135 to 0930	7.92	168.84	None	None	
October 11, 1977	Bottom	0135 to 0930	7.92	142.77	None	None	
October 17, 1977	Surface	0920 to 1730	8.17	168.05	None	None	
October 17, 1977	Bottom	0920 to 1730	8.17	147.09	None	None	
October 17-18, 1977	Surface	1740 to 0130	7.83	161.19	None	None	
October 17-18, 1977	Bottom	1740 to 0130	7.83	141.09	None	None	
October 18, 1977	Surface	0140 to 0920	7.67	157.76	None	None	
October 18, 1977	Bottom	0140 to 0920	7.67	138.08	None	None	

TABLE E-1
(Continued)

<u>Collection Date</u>	<u>Collection Level</u>	<u>Hours of Collection</u>	<u>Collection Time (Hours)</u>	<u>Actual Volume of Water Pumped (Cubic Meters)</u>	<u>Number of Fish Eggs</u>	<u>Total Number of Fish Larvae</u>	<u>Description of Larvae Collected</u>
October 24, 1977	Surface	0930 to 1745	7.25	148.59	None	None	
October 24, 1977	Bottom	0930 to 1745	7.25	148.59	None	None	
October 24-25, 1977	Surface	1800 to 0130	7.5	154.33	None	None	
October 24-25, 1977	Bottom	1800 to 0130	7.5	135.08	None	None	
October 25, 1977	Surface	0135 to 0930	7.92	162.90	None	None	
October 25, 1977	Bottom	0135 to 0930	7.92	142.59	None	None	
October 31, 1977	Surface	0920 to 1710	7.83	168.05	None	None	
October 31, 1977	Bottom	0920 to 1710	7.83	147.09	None	None	
October 31, 1977	Surface	1715 to 0100	7.75	159.48	None	None	
November 1, 1977	Bottom	1715 to 0100	7.75	139.59	None	None	
November 1, 1977	Surface	0115 to 0900	7.75	159.48	None	None	
November 1, 1977	Bottom	0115 to 0900	7.75	139.59	None	None	

*Estimated number of fish eggs

APPENDIX F

PUMPHOUSE OPERATING DATA AND LAKE AND WEATHER
CONDITIONS AT USSC GARY WORKS

TABLE F-1

PUMPHOUSE OPERATING DATA DURING IMPINGEMENT-ENTRAINMENT STUDY AT
U.S. STEEL CORPORATION'S GARY WORKS LAKESIDE PUMPHOUSE

Date	Temperature		Operational Screens (4 screens)	Operational Pumps (5 pumps)	Volume Water Pumped (mgd)
	Intake (°F)	Discharge (°F)			
January 27-28, 1977	34	36	4	3	155.3
February 24-25, 1977	36	44	4	3	145.2
March 17-18, 1977	40	54	4	3	139.7
April 6-7, 1977	44	52	4	3	141.6
April 14-15, 1977	47	50	4	2	112.9
April 21-22, 1977	44	44	4	3	106.4
April 28-29, 1977	50	56	4	3	161.6
May 5-6, 1977	50	60	4	3	168.0
May 12-13, 1977	51	56	4	2	146.2
May 19-20, 1977	50	56	4	2/3*	135.4
May 26-27, 1977	54	60	4	2	126.6
May 31 - June 1, 1977	63	72	4	3	167.0
June 6-7, 1977	62	73	4	3	172.8
June 13-14, 1977	61	72	4	3	166.3
June 20-21, 1977	62	72	4	3	173.5
June 27-28, 1977	56	65	4	3	169.9
July 5-6, 1977	56	64	4	3	172.8
July 11-12, 1977	67	66	4	3	175.7
July 18-19, 1977	54	64	4	3	154.1
July 25-26, 1977	60	72	4	3	167.8
August 1-2, 1977	71	82	4	3	161.3
August 8-9, 1977	62	64	4	3	165.5
August 15-16, 1977	66	74	4	3	166.3
August 22-23, 1977	65	74	4	3	169.2
August 29-30, 1977	56	63	4	3	174.2
September 6-7, 1977	67	76	4	3	170.2
September 12-13, 1977	62	69	4	3	164.2
September 19-20, 1977	54	63	4	3	168.6
September 26-27, 1977	56	62	4	3	142.6
October 3-4, 1977	58	66	4	3	152.6
October 10-11, 1977	55	66	4	3	161.3
October 17-18, 1977	53	65	4	3	152.2
October 24-25, 1977	51	68	4	3	146.9
October 31 - November 1, 1977	53	66	4	3	151.9
November 10-11, 1977	54	62	4	3	141.1
December 8-9, 1977	38	42	4	2	144.9

* Two until 2400 hr, 3 from 2400 hr.

TABLE F-2

PUMPHOUSE OPERATING DATA DURING IMPINGEMENT-ENTRAINMENT STUDY AT
U.S. STEEL CORPORATION'S GARY WORKS NO. 1 PUMPHOUSE

Date	Temperature		Operational Screens (14 screens)	Operational Pumps (10 pumps)	Volume Water Pumped (mgd)	Deicing Status
	Intake (°F)	Discharge (°F)				
January 27-28, 1977	34	37	14	7	299.4	On
February 24-25, 1977	36	42	14	6	265.4	On
March 17-18, 1977	40	52	14	(7)	347.9	Off
April 6-7, 1977	46	58	14	6	295.7	Off
April 14-15, 1977	49	51	14	6	296.4	Off
April 21-22, 1977	48	60	14	6	293.9	Off
April 28-29, 1977	51	54	14	5	294.7	Off
May 5-6, 1977	52	59	14	7	293.5	Off
May 12-13, 1977	53	59	14	5	300.2	Off
May 19-20, 1977	53	76	14	7	299.7	Off
May 26-27, 1977	59	76	14	7	294.3	Off
May 31 - June 1, 1977	64	90	14	7	298.1	Off
June 6-7, 1977	62	82	14	7	296.0	Off
June 13-14, 1977	62	86	14	5	293.5	Off
June 20-21, 1977	65	82	14	7	296.0	Off
June 27-28, 1977	64	82	14	7	299.4	Off
July 5-6, 1977	65	87	14	7	301.2	Off
July 11-12, 1977	69	89	14	7	290.4	Off
July 18-19, 1977	60	87	14	7	295.5	Off
July 25-26, 1977	72	89	14	7	296.0	Off
August 1-2, 1977	74	90	14	7	291.0	Off
August 8-9, 1977	72	88	14	7	296.2	Off
August 15-16, 1977	75	91	14	7	305.0	Off
August 22-23, 1977	70	90	14	7	305.3	Off
August 29-30, 1977	64	84	14	7	306.6	Off
September 6-7, 1977	68	84	14	7	299.9	Off
September 12-13, 1977	65	83	14	6	303.1	Off
September 19-20, 1977	60	82	14	8	296.8	Off
September 26-27, 1977	61	83	14	8	297.5	Off
October 3-4, 1977	61	80	14	7	301.9	Off
October 10-11, 1977	56	79	14	7	301.8	Off
October 17-18, 1977	60	70	14	7	296.2	Off
October 24-25, 1977	59	72	14	6	243.3	Off
Oct. 31 - Nov. 1, 1977	60	73	14	7	242.5	Off
November 10-11, 1977	54	68	14	4	241.8	Off
December 8-9, 1977	44	52	14	7	298.9	Off

TABLE F-3

LAKE AND WEATHER CONDITIONS DURING IMPRINGEMENT-ENTRAINMENT
STUDY AT U.S. STEEL CORPORATION'S GARY WORKS

Date	Weather Conditions	Wind		Wave Height (ft)	Air Temperature (°F)
		Speed (mph)	Direction		
January 27-28, 1977	Snow	27	W	Ice	-5
February 24-25, 1977	Cloudy, cool	18	W	1-2	40
March 17-18, 1977	Cloudy, rain	18	E	1-3	35
April 6, 1977	Partly cloudy	18	W	3	43
April 7, 1977	Partly sunny	10	NW	(calm)	62
April 14, 1977	Partly sunny	12	NE	1	46
April 15, 1977	Sunny	9	E	(calm)	78
April 21, 1977	Light rain	5	SE	(calm)	66
April 22, 1977	*	15	N	3-4	43
April 28, 1977	Rain	18	N	6-7	41
April 29, 1977	Sunny	7	E	5-6	56
May 5, 1977	Clear	15	SW	<1	75
May 6, 1977	Cloudy	7	SE	(calm)	66
May 12, 1977	Sunny	10	W	1	75
May 13, 1977	Sunny	10	W	1-2	82
May 19, 1977	Sunny	6	W	(calm)	87
May 20, 1977	Sunny	5	SW	(calm)	87
May 26, 1977	Sunny	8	NE	1-1.5	75
May 27, 1977	Sunny	7	NE	1-1.5	75
May 31, 1977	Sunny	12	SW	3	80
June 1, 1977	Overcast	24	NW	3	68
June 6, 1977	Partly cloudy	25	N	4-6	68
June 7, 1977	*	8	NW	4-6	60
June 13, 1977	Partly cloudy	10	NE	1-2	70
June 14, 1977	Sunny	15	NE	3	75
June 20, 1977	Partly cloudy	13	W	1	80
June 21, 1977	Partly cloudy	13	E	1	70
June 27, 1977	Partly cloudy	5-10	SW	(calm)	91
June 28, 1977	Partly cloudy	10	S	(calm)	85
July 5, 1977	*	10	SW	(calm)	95
July 6, 1977	*	*	SW	*	90
July 11, 1977	Rain, overcast	10	S	(calm)	88
July 12, 1977	Rain	10	S	1	80
July 18, 1977	Cloudy	10	N	1	90
July 19, 1977	Clear	8	S	*	80
July 25, 1977	Partly cloudy	18	N	4-5	75
July 26, 1977	Clear	7	W	1-2.5	75
August 1, 1977	Partly cloudy	8	NE	1-2	80
August 2, 1977	*	12	S	(calm)	75
August 8, 1977	Rain, overcast	7	S	*	91
August 9, 1977	Cloudy	5	S	(calm)	70
August 15, 1977	Sunny	14	E	2-3	80
August 16, 1977	Rain, overcast	14	S	(calm)	75
August 22, 1977	*	10	W	2	75
August 23, 1977	Rain/cloudy	12	NE	1	74
August 29, 1977	Partly cloudy	10-15	NW	1	78
August 30, 1977	Clear	5	SW	(calm)	83
September 6, 1977	Partly cloudy	12	SE	(calm)	78
September 7, 1977	Cloudy	5	SW	(calm)	70
September 12, 1977	Rain	8	S	(calm)	64
September 13, 1977	Rain	5	S	(calm)	65
September 19, 1977	Overcast	10-15	SW	0.5	69
September 20, 1977	Partly sunny	15	SW	0.5-0.7	65
September 26, 1977	Clear	5-10	SW	0.5	72
September 27, 1977	Partly cloudy	10-15	N	1.5	60
October 3, 1977	Sunny	12	NW	3-4	60
October 4, 1977	Sunny	12	S	1	69
October 10, 1977	Partly sunny	15	S	1	63
October 11, 1977	Rain/cloudy	10	SW	(calm)	*
October 17, 1977	Clear	15	SW	(calm)	60
October 18, 1977	Cloudy/rain	13	*	3	52
October 24, 1977	Partly cloudy	5	NE	(calm)	62
October 25, 1977	Rain	8	S	(calm)	60
October 31, 1977	Cloudy	16	S	(calm)	60
November 1, 1977	Cloudy	8	SE	(calm)	60
November 10, 1977	Snow flurries	16	SW	(calm)	34
November 11, 1977	Sunny	13	NW	4-5	36
December 8, 1977	Cloudy	3	NE	(calm)	15
December 9, 1977	Clear	18	W	(calm)	-1

* Data not given.

APPENDIX G
STATISTICAL CALCULATIONS

TABLE G-1

ESTIMATED TOTAL NUMBER AND WEIGHT OF ALEWIVES IMPINGED ANNUALLY ON THE TRAVELING SCREENS OF USSC GARY WORKS LAKESIDE PUMPHOUSE INTAKE

Month	Daily Number of Fish Impinged	Daily Weight of Fish Impinged (grams)	Days per Month	Estimated Total Number of Fish Impinged per Month*	Estimated Total Weight of Fish Impinged per Month (kilograms)*
January	0	0	31	0	0
February	0	0	28	0	0
March	0	0	31	0	0
April	0	0	30	22.5	0.728
April	1	48.6			
April	0	0			
April	2	48.4			
May	6	292.5	31	322.4	11.629
May	29	996.1			
May	5	205.1			
May	7	237.5			
May	5	144.4			
June	5	151.1	30	547.5	14.528
June	35	929.9			
June	21	529.3			
June	12	326.7			
July	2	56.7	31	139.5	3.698
July	8	196.8			
July	3	81.5			
July	5	142.1			
August	5	149.7	31	49.6	1.471
August	1	22.4			
August	0	0			
August	0	0			
August	2	65.1			
September	1	38.7	30	7.5	0.290
September	0	0			
September	0	0			
September	0	0			
October	21	43.1	31	348.8	1.091
October	2	24.6			
October	19	67.3			
October	3	5.8			
November	0	0	30	30.0	0.513
November	2	34.2			
December	141	4809.2	31	4371.0	149.085
TOTALS				5838.8	183.033 (403.52 pounds)

* In cases where more than one sample was collected during a month, the collection totals for the month were multiplied by a factor which was determined by dividing the total days per month by the number of samples collected per month.

TABLE G-2

ESTIMATED TOTAL NUMBER AND WEIGHT OF RAINBOW SMELT IMPINGED ANNUALLY ON
THE TRAVELING SCREENS OF USSC GARY WORKS LAKESIDE PUMPHOUSE INTAKE

Month	Daily Number of Fish Impinged	Daily Weight of Fish Impinged (grams)	Days per Month	Estimated Total Number of Fish Impinged per Month*	Estimated Total Weight of Fish Impinged per Month (kilograms)*
January	0	0	31	0	0
February	1	1.3	28	28.0	0.036
March	0	0	31	0	0
April	1	0.5	30	22.5	0.031
April	1	2.5			
April	0	0			
April	1	1.1			
May	0	0	31	0	0
May	0	0			
May	0	0			
May	0	0			
May	0	0			
June	0	0	30	0	0
June	0	0			
June	0	0			
June	0	0			
July	0	0	31	15.5	0.002
July	0	0			
July	0	0			
July	0	0.2			
August	0	0	31	266.6	0.156
August	20	3.2			
August	11	19.3			
August	3	0.5			
August	9	2.1			
September	3	0.9	30	52.5	0.026
September	0	0			
September	2	1.1			
September	2	1.4			
October	585	396.6	31	6192.3	4.266
October	51	30.3			
October	109	76.3			
October	54	47.2			
November	29	24.7	30	450.0	0.377
November	1	0.4			
December	51	50.6	31	1581.0	1.569
TOTALS				8605.4	6.463 (14.25 pounds)

* In cases where more than one sample was collected during a month, the collection totals for the month were multiplied by a factor which was determined by dividing the total days per month by the number of samples collected per month.

TABLE G-3

ESTIMATED TOTAL NUMBER AND WEIGHT OF ALEWIVES IMPINGED ANNUALLY ON THE
TRAVELING SCREENS OF USSC GARY WORKS NO. 1 PUMPHOUSE INTAKE

Month	Daily Number of Fish Impinged	Daily Weight of Fish Impinged (grams)	Days per Month	Estimated Total Number of Fish Impinged per Month*	Estimated Total Weight of Fish Impinged per Month (kilograms)*
January	0	0	31	0	0
February	0	0	28	0	0
March	8	408.0	31	248.0	12.648
April	3,205	120,790.3	30	415,297.5	15,895.406
April	14,403	587,832.2			
April	17,603	658,018.4			
April	20,162	752,746.5			
May	11,861	437,312.1	31	172,099.6	5,992.610
May	10,601	356,386.4			
May	1,554	60,471.4			
May	2,212	68,628.9			
May	1,530	43,751.2			
June	1,372	35,810.8	30	55,462.5	1,448.249
June	2,999	74,354.3			
June	1,972	54,984.3			
June	1,052	27,950.4			
July	38	929.6	31	19,026.3	473.973
July	892	23,457.6			
July	1,093	26,656.7			
July	432	10,113.9			
August	70	1,548.3	31	3,713.8	52.156
August	40	763.5			
August	28	661.8			
August	77	2,032.6			
August	384	3,406.0			
September	114	959.1	30	48,112.5	111.812
September	35	615.7			
September	4,952	8,214.4			
September	1,314	5,119.0			
October	242	1,431.6	31	11,749.0	30.850
October	157	381.4			
October	1,072	1,942.9			
October	45	224.8			
November	27	77.7	30	5,025.0	31.334
November	308	2,011.2			
December	136	2,808.6	31	4,216.0	87.067
TOTALS				734,950.2	24,136.106 (53,211.00 pounds)

* In cases where more than one sample was collected during a month, the collection totals for the month were multiplied by a factor which was determined by dividing the total days per month by the number of samples collected per month.

TABLE G-4

ESTIMATED TOTAL NUMBER AND WEIGHT OF RAINBOW SMELT IMPINGED ANNUALLY ON
THE TRAVELING SCREENS OF USSC GARY WORKS NO. 1 PUMPHOUSE INTAKE

Month	Daily Number of Fish Impinged	Daily Weight of Fish Impinged (grams)	Days per Month	Estimated Total Number of Fish Impinged per Month*	Estimated Total Weight of Fish Impinged per Month (kilograms)*
January	35	48.7	31	1085.0	1.510
February	7	7.0	28	196.0	0.196
March	71	86.3	31	2201.0	2.675
April	53	82.4	30	1537.5	7.530
April	28	83.1			
April	63	286.8			
April	61	551.7			
May	22	245.3	31	477.4	3.404
May	38	104.2			
May	8	45.4			
May	7	126.6			
May	2	27.5			
June	1	15.3	30	7.5	0.115
June	0	0			
June	0	0			
June	0	0			
July	1	4.2	31	147.3	0.054
July	0	0			
July	1	0.2			
July	17	2.6			
August	1	0.3	31	334.8	0.120
August	2	0.3			
August	8	1.5			
August	8	0.8			
August	35	16.5			
September	54	22.5	30	1672.5	1.981
September	4	27.6			
September	19	41.9			
September	146	172.1			
October	1429	1178.0	31	33053.8	30.138
October	1250	1065.1			
October	1497	1556.8			
October	89	88.9			
November	52	54.7	30	4155.0	5.999
November	225	345.2			
December	354	337.9	31	10974.0	10.475
TOTALS				55841.8	64.197 (141.53 pounds)

* In cases where more than one sample was collected during a month, the collection totals for the month were multiplied by a factor which was determined by dividing the total days per month by the number of samples collected per month.

TABLE 3-5

WILCOXON'S SIGNED-RANKS TEST FOR TWO GROUPS, ARRANGED AS PAIRED OBSERVATIONS
FOR SURFACE AND BOTTOM SAMPLES OF FISH EGGS AND LARVAE COLLECTED AT
USSC GARY WORKS LAKESIDE PUMPHOUSE INTAKE

Number of Fish Larvae per 1000 cubic meters of water				Number of fish eggs per 1000 Cubic meters of water			
Surface	Bottom	Differences	Rank	Surface	Bottom	Differences	Rank
2	5	-3	-4	4	2	+2	+1
36	52	-16	-7	1134	1625	-491	-11
4	25	-21	-8	704	699	+5	+2
2	11	-9	-6	744	885	-141	-7
4	5	-1	-2	1033	953	+80	+5
4	5	-1	-2	979	1903	-924	-12
4	2	+2	+3	2591	2325	+266	+10
39	16	+23	+9	4520	3287	+1233	+13
11	7	+4	+5	2267	2106	+161	+8
11	12	-1	-2	2387	3940	-1553	-14
				585	358	+227	+9
				135	57	+78	+4
				14	2	+12	+3
				171	51	+120	+6

 $T_S = 17, \quad n = 10$

T_s of 17 is larger than the critical value of 10.8 at $p = 0.05$ in the one-tail test, so we conclude that at the 5 percent level of significance, the surface pump was not collecting more larval fish than the bottom pump.

$$T_S = 44, n = 74$$

T_S of 44 is larger than the critical value of 25.7 at $p = 0.05$ in the onetail test, so we conclude that at the 5 percent level of significance, the surface pump was not collecting more fish eggs than the bottom pump.

TABLE G-6

FRIEDMAN'S TWO-WAY ANALYSIS OF VARIANCE BY RANKS FOR FISH EGGS COLLECTED
AT DIFFERENT TIME PERIODS DURING THE DAY AT USSC GARY WORKS LAKESIDE PUMPHOUSE INTAKE

Time Periods	Number of Fish Eggs per 1000 Cubic Meters of Water									Σ
	28	317	259	769	290	500	1816	2215	56	
~1000 to 1800 hrs	1146	842	1201	977	1514	3465	849	3942	24	
~1800 to 0200 hrs	1563	1282	1563	2567	5671	7898	3898	3146	1359	
Time Periods	Ranks									Σ
	1	1	1	1	1	1	2	1	2	
~1000 to 1800 hrs	2	2	2	2	2	2	1	2	1	11
~1800 to 0200 hrs	3	3	3	3	3	3	3	3	3	16
~0200 to 1000 hrs										27

$$X_r^2 = \frac{12}{(3)(9)(4)} (1106) - 3(9)(4) = 14.888$$

TABLE G-7

FRIEDMAN'S TWO-WAY ANALYSIS OF VARIANCE BY RANKS FOR FISH LARVAE
COLLECTED AT DIFFERENT TIME PERIODS DURING THE DAY AT
USSC GARY WORKS LAKESIDE PUMPHOUSE INTAKE

Time Periods	Number of Fish Larvae per 1000 Cubic Meters of Water										Σ
	50	6	9	3	3	3	7	3			
~1000 to 1800 hrs	50	6	9	3	3	3	7	3			17.5
~1800 to 0200 hrs	49	32	7	3	25	10	3	3			18.0
~0200 to 1000 hrs	35	3	3	3	6	14	3	7			14.5

Time Periods	Ranks										Σ
	3	2	3	2	1	1	3	2.5			
~1000 to 1800 hrs	3	2	3	2	1	1	3	2.5			17.5
~1800 to 0200 hrs	2	3	2	2	3	2	1.5	2.5			18.0
~0200 to 1000 hrs	1	1	1	2	2	3	1.5	3			14.5

$$X_r^2 = \frac{12}{(3)(8)(4)} (840.5) - 3(8)(4) = 9.0625$$